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## BRAZILIAN ROCK INSCRIPTIONS.

BY PROF. CH. FRED. HARTT.



It is a great shame that the antiquities of Brazil have so far received little or no attention, yet the country is one whose ethnology is extremely interesting, and it is very desirable that the history of its many tribes should be traced out. The neglect of Brazilian antiquities has arisen, no doubt, from the comparative rarity of the relics and the difficulty of exploring the country. Stone implements are found all over the empire, ancient pottery occurs in many localities, especially in burial stations, and Kjökkenmöddings exist on the coast as at Santa Cruz in the Province of Espiritu Santo, on the Bay of Rio de Janeiro, at Santos and elsewhere. But they have attracted very little attention, though they are occasionally mentioned by travellers.

During my expedition last summer to the Amazonas, I lost no opportunity of studying the antiquities of the country, and I was successful in collecting a few facts of importance. On the Rio Tocantins near the lower falls, I found figures engraved on rocks, and from the cliffs of the Serra do Ereré I copied a great number of rude figures and signs drawn in red paint. My good friend, Senhor Ferreira Penna, at Pará, was kind enough to give me a series of drawings from the Serra of Obidos, which locality I did not visit, together with the original MS. and drawings of a Government report on certain Indian drawings on the Rio Oyapock.

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I sent one of my assistants, Mr. Barnard, to examine a burial station on the Island of Marajó, and he brought me a small collection of pottery presenting some interesting features. In this article I shall confine myself to a description of the inscriptions I have collected, hoping in another article to describe the pottery and other relics.

The Tocantins inscriptions occur at Alcobaça, a point on the left bank of the river, near the first falls, and about one hundred miles from the mouth of the river. Here are exposed on the banks during the dry season beds of a fine-grained, very hard, dark red or brown quartzite, the strata having only a slight dip. Joints divide the beds into large blocks which often lie in place, but along a part of the shore they are piled up in confusion. During several months of the year, when the river is high, the locality is under water, as is the case with similar incised rocks at Serpa on the Amazonas. My guide told me that here were *letreiros*, or Indian inscriptions, and I was fortunate enough, not only to find several, but to be able to bring away with me two small incised blocks. The figures are pecked into the rock by means of some blunt pointed instrument. They are so rude and irregular, that I see no reason why a pointed stone may not have answered the purpose. The grooves are usually wide and not very deep. Occasionally the unskilful hand missed its mark and marred the figure. These figures are usually cut on the sides of the blocks of rock and show much wear; many are hard to trace, and the majority are more or less covered by a shining black film of manganese deposited by the water. The surface of one of my specimens, Pl. 2, fig. 5, has a metallic lustre, like that of a well blackened stove.

Of these inscriptions, Pl. 2, fig. 1, which is about sixteen inches in length and is somewhat badly preserved, appears to represent a human figure, but it has a decapitated look. It may perhaps be intended to represent some lower animal. The position of the arms and legs conforms to the type of ordinary Indian representations of the human form, as we shall see further on.

The other figures are, for the most part, more or less complicated spirals. Pl. 2, figures 2, 4, 5, 7, and 11. One of these, Pl. 2, fig. 4, may represent the human face, the upper diverging lines being the eyebrows, the medial descending loop the nose, and the spiral the eyes. Equally rude representations of the face occur elsewhere.

About half a mile above the locality where the figures occur, I found on the upper surfaces of several masses of sandstone, places worn by grinding. Some of these were circular, about a foot in diameter, quite shallow, and with a convex prominence in the middle showing that a tool, probably a stone axe, had been ground with a circular motion. One of these hollows is represented in Pl. 2, fig. 6. Others were shallow, oval hollows, a foot or more in length, made by rubbing the tool backward and forward. I saw also a long, narrow, and rather deep groove worn in the same way, perhaps in the grinding of arrowheads. These grinding surfaces looked to me totally unlike those made in sharpening metal tools. It is important to note that on the Tocantins, this is almost the only place where sandstones occur. There is a great want of sharp sandstones suitable for whetstones or grindstones, not only on the Amazonas, but in Brazil generally, as I have already elsewhere remarked. This locality would be likely to be frequented by savages for the purpose of grinding and manufacturing stone implements. I saw no chips on the spot. It will be borne in mind that the locality is swept annually by floods.

At Jequerapuá, a few miles farther down on the same side of the river, I found on the rocks the spiral represented on Pl. 2, fig. 3, near which was a conical hole.

Engraved figures occur elsewhere in Brazil, on the lower part of the Rio de São Francisco (Williams and Burton), in the Province Parahyba (Koster), on the Rio Negro, etc.

The Serra do Ereré is situated on the northern side of the valley of the Amazonas at a distance of fifteen or more miles from the main river, but a short distance from the Rio Gurupatuba, a few miles west of the Villa de Monte Alegre. It is a narrow, very irregular ridge, about 800 feet high, running approximately east west, and about four to five miles long. The rock is sandstone in very heavy beds inclined to the southeastward. These sandstones form a broken line of cliffs running along the western side near the top, below which is a very irregular rocky slope. On these walls of rock, at and near the western end of the Serra, sometimes near their base, sometimes high up in conspicuous situations difficult of access, are great numbers of rude characters and figures, for the most part in red paint, some isolated, others in groups. Some rock surfaces are thickly covered with them, many being so washed by rains and defaced by fires as not to be traced out, others being

bright and fresh, suggesting that they were not all executed at the same time. Standing just in advance of the line of cliffs at some distance east of the western end of the Serra is a tall, tower-like mass of sandstone painted not only on the base but high up on the sides, while the cliffs behind and on both sides are covered with figures. All these localities are very conspicuous and some of them are so large as to be visible at the distance of more than a mile.

Not far from the eastern end of the Serra there is on top an enormous isolated mass of sandstone, the remains of a bed almost entirely removed, which mass is distinctly visible from the plain below on the northern side. The irregular western wall of this mass is covered with figures.

The drawings of Ereré comprise several classes of objects. The most important among these appear to be representations of the sun, moon and stars. At the western end of Ereré, on the cliff near the top, is a rude circular figure Pl. 4, fig. 17, nearly two feet in diameter. The general color is a brownish yellow. In the centre is a large ochre red spot, while around the circumference runs a broad border of the same color. Some of the civilized Indians at Ereré called this the sun, others the moon.

On a very prominent cliff some distance east of the tower-like mass of sandstone above described, is another similar figure about three feet in diameter. In this there is a central spot of brick red, then a broad zone of a dirty yellow, followed by a zone of brick red, outside which is another of a dirty ochre yellow. To the right of this are two smaller circular figures, in the upper of which the lines and centre are red, the innermost zone being of a dirty yellow tint. These figures are situated some ten feet from the foot of the cliff. Similar drawings, composed of two or more concentric circles with or without the central spot, occur in great numbers at Ereré. I am disposed to think that they are intended to represent the moon, since they are not furnished with rays.\* One figure, Pl. 4, fig. 2, on the cliff at the western end of the Serra, undoubtedly represents this heavenly body.† Besides the above forms there are rayed figures in abundance. Sometimes they con-

\* I found a report afloat in Pará that some of these figures had been mutilated by Major Continho, Prof. Agassiz's companion on the Amazonas. The report is false, as the figures are not mutilated.

† Similar figures occur elsewhere. Seeman, *Memoirs Anthropol. Soc.*, London, Vol. ii, p. 279, gives two examples, one from Veraguas, New Grenada, another from England.

sist of a single circle, or several concentric circles, the outer one, only, being rayed, but on the side of the great rock on the top of the Serra is a figure a foot in diameter (Pl. 5, fig. 10), and very distinct, formed of two concentric circles, each with a few large, tooth-shaped rays. Part of this figure is obliterated. At the same locality is another figure consisting of a circle with serrated rays with only a spot in the centre.

Not infrequently, on the painted rock at the western end of the Serra, occur circles, single or double, sometimes nucleated, which bear rays only on the upper side, Pl. 5, fig. 12, Pl. 6, fig. 1. There are rayed spirals as well, Pl. 4, fig. 3. Some of these appear to represent stars. They are either drawn or impressed. In some cases the palm and fingers were covered with wet paint and then pressed upon the rock. Whether these figures always represent stars is doubtful. At the western end of the Serra is a curious rayed head, ornamented on top with what looks like a *queue*, suggesting a comet. At the same locality is the remarkable figure, Pl. 4, fig. 9, three and one-half feet high, which looks as though it might represent the impersonation of the sun. Just west of the tower-like mass is a rock face covered with a large group of what are apparently figures of the heavenly bodies. They are represented in Pl. 5, fig. 1, and are large and distinctly drawn. The whole group is some six or seven feet long. Of animate objects the human form and human face are very frequently delineated. They are all exceedingly rude and are just such figures as children are fond of drawing. Sometimes the body and limbs are represented each by a single line, as in Pl. 3, figures 3 and 8.

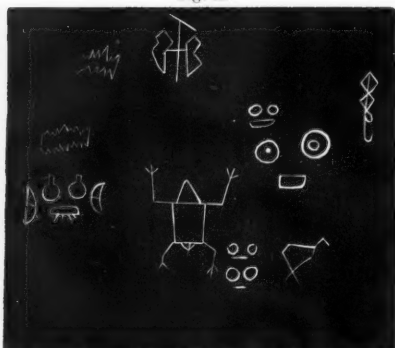
It is noticeable that human figures are never drawn in profile, which is the rule with similar drawings by North America Indians (Catlin). The eyes and mouth are usually alone represented, one eye being often smaller than the other. There is often no nose, or a heavy V-shaped curve is drawn over the eyes, the apex projecting down more or less between them, representing the nose, as in Pl. 3, fig. 1, Pl. 4, figures 12 and 15.

In some ancient pottery to be described in a future paper the same peculiarity is observable in the representation of the human head, the eyebrows and nose forming a prominent T-shaped ridge. As the most of the busts in terra cotta show the head flattened from before backward, I would suggest that the Indians who made

the drawings at Ereré, and the pottery in Marajó may have flattened the head as the Omaguas and Flatheads do to-day, which would give a greater prominence to the brows than in the normally shaped skull.

The stiff angular position of the arms and legs of the figures is interesting, the upper arms being held at right angles to the body, the forearm bent at a similar angle and usually upwards. The legs are wide apart, the thigh extending often straight out from the body. The figures are usually erect, but there is one on the west end of the Serra represented as lying on the side, Pl. 7, fig. 2. Below it is a figure of a snake, the whole appearing to commemorate the death of some one from snake-bite. Some of the heads are rayed as in the case of Pl. 3, fig. 1. These may perhaps represent the sun or moon. Some rough drawings of the

Fig. 42.



Group of Rock Paintings at Ereré.

human face are made on angular projections of the rock, as is the case with that figured in Pl. 4, fig. 10, where the sharp edge represented the nose. Another face is made by drawing lines around two contiguous, circular depressions, converting them into eyes, and drawing a straight line below for a nose.

It is interesting to observe that the hands and feet are always represented by radiating lines, usually only three digits being drawn for each hand and foot. The number of digits represented rarely reaches four, and never five, so far as I have observed. An explanation of this may perhaps lie in the fact that many tribes of Brazil are unable to count beyond three or four. Of the lower animals, several kinds are represented, but so rudely that it is, in most cases, difficult to determine the species. The large figure, Pl. 5, fig. 6, my Indian guide pronounced a *mucura*, a species of opossum, and he called the four-legged and long-tailed animals, Pl. 9, alligators. Birds appear to be rarely represented. On Pl. 9, are two figures, *b* and *d*, that may be intended for these ani-

mals. There are several drawings of the *yuarauá*, or sea cow, Pl. 4, fig. 3 (?), Pl. 5, fig. 3, Pl. 7, fig. 7. Of fishes, there are two at least, Pl. 5, fig. 8, and Pl. 6, fig. 4. It is worthy of remark that there are no drawings of the dog, ox, or horse, and I have seen no figures of plants. Senhor Penna, in a MS., says that trees are sometimes represented, together with "canoes, oars, benches, and other objects of common use," but I have seen no such figures at Ereré, though they may occur elsewhere.

In the accompanying plates, I have given many examples of drawings of doubtful significance. The scroll, Pl. 4, figures 5 and 7, Pl. 5, fig. 4, Pl. 7, fig. 5, occurs frequently, and also the design Pl. 7, fig. 8, which varies somewhat in different drawings. The complicated rectilinear figure, Pl. 6, fig. 2, is painted on the side of the isolated rock mass on the top of the Serra and is about sixteen inches in height.\* The Greek fret occurs once or twice at Ereré and quite frequently on the Marajó pottery.

The red paint used in the inscriptions, is, I believe, annatto, perhaps also clay. It is very rudely smeared on the rough surface of the sandstone, sometimes when quite dry. There are some drawings in which the paint was laid on as a thin wash which dripped over the rock. I think the painting was largely done with the fingers. In some places the rock is soiled where the Indian assisted himself by the hand in climbing. The yellow color was prepared from clay.

The drawings of the Tocantins and of Ereré were carefully copied. The figures on the plates were transferred directly to the wood from my original sketches. I do not claim for them photographic accuracy, but I am sure they give faithfully the Indian idea. The original inscriptions are even more rude in finish than might be inferred from the plates. Precisely similar figures to those of the Tocantins and Ereré occur on the Rio Uaupés (Wallace) scraped on hard granitic (gneissic?) rock.

I have given on Pl. 9, accurate reductions of the copies of the figures on the Serra da Escama, kindly placed in my hands by Senhor Penna. A note, accompanying the sketches, says that the drawings were found on seven stones on the top of the Serra da Escama, about 400 bracas distant from the city of Obidos. The most of these are wholly unintelligible to me. One, fig. 2, appears to represent the sun, and another the moon or sun.

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\* In the plate the *right* is the *lower* side of this figure.

According to traditions, Bento Maciel, the first donatory of the ancient Capitania do Cabo do Norte, set up marks fixing the limits between his Captaincy and French Guayana, but these marks, when the boundary question afterward arose, could not be found. In 1727 the Captain, João Paes do Amaral, who had been on service in the north, reported having discovered them on the Rio Oyapock. So important was this announcement that the Governor of Pará immediately sent the Alferes Palheta with a party to report on the discovery. This expedition proved unsuccessful, and in 1728 another expedition under Captain Pinto da Gaya was sent out. This officer discovered the supposed marks on the top of a hill called Mont d'Argent and was disappointed to find them nothing but Indian drawings. These he had all carefully copied in ink, his drawings being submitted to the government, with his report. The original papers and sketches Senhor Penna has been so kind as to place in my hands. Of one of the sets of drawings I have made an accurate reduction on Pl. 10, by the aid of photography. Figures 2, 3, and 4, on the same plate, are from another set of sketches accompanying the above report. These figures resemble in many points Indian drawings from Brazil, but the square spiral recalls some Mexican ornaments.

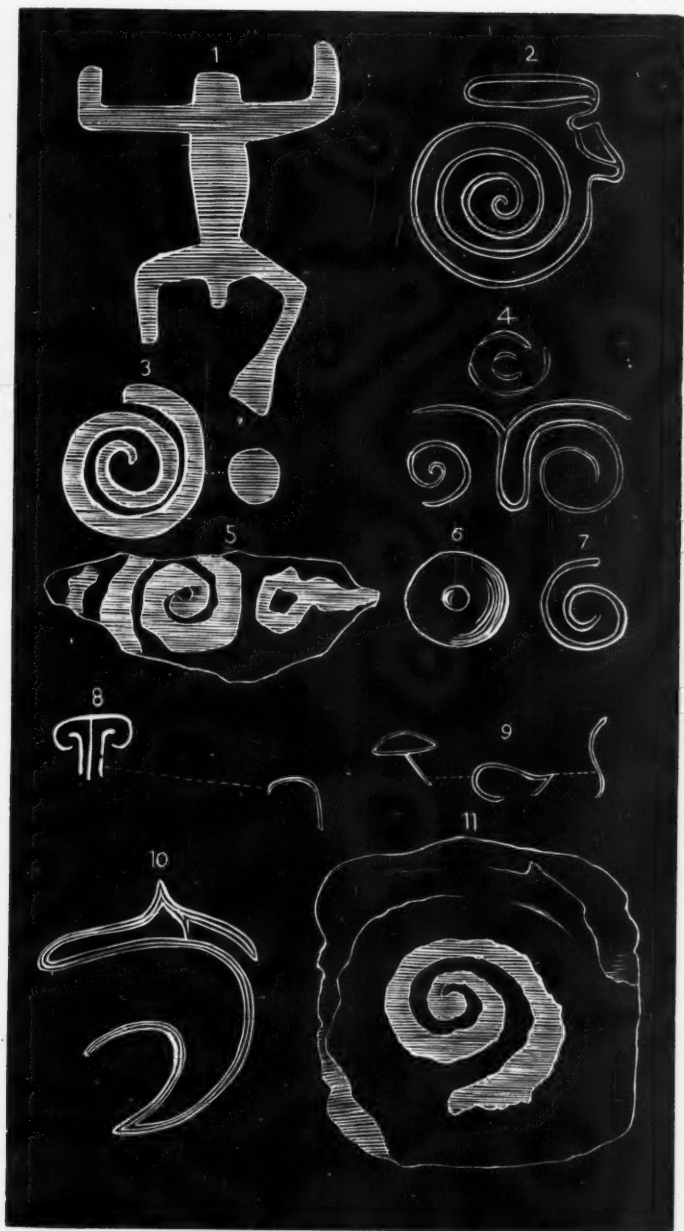
The antiquity of the rock paintings and sculptures of Eastern South America is undoubted, and they are mentioned by many of the ancient writers, as well as by Humboldt and others in more recent times. It is well known that the drawings of Ereré, and those of Obidos, about to be described, existed more than two hundred years ago. There can be no doubt that they antedate the civilization of the Amazonas, and there is a strong probability that some of them, at least, were drawn before the discovery of America.\* I hold it most probable that the rock paintings and sculpturings were made by tribes which inhabited the Amazonas previous to the Tupí invasion. The sculpturings are supposed to be older than the paintings. This is also, I believe, the opinion of Senhor Penna. I think the Ereré figures have a deep significance. A people that would go to so much trouble as to draw figures of the sun and moon high up on cliffs on the tops of mountains must

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\* At Ereré occur the half obliterated sign, I. H. S., and the date 1764 (Pl. 4), evidently the work of the Jesuits. These last inscriptions are very fresh and are drawn in a lighter red on the lichen-blackened or whitened surface that obscures the older inscriptions.

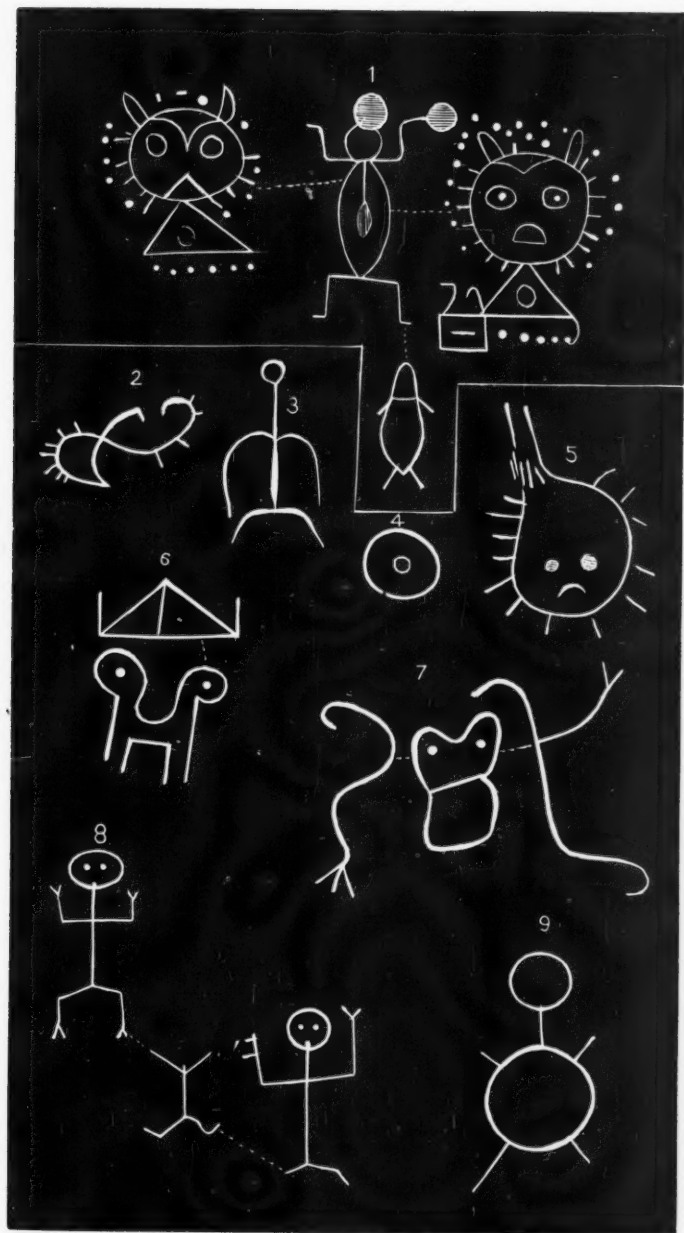






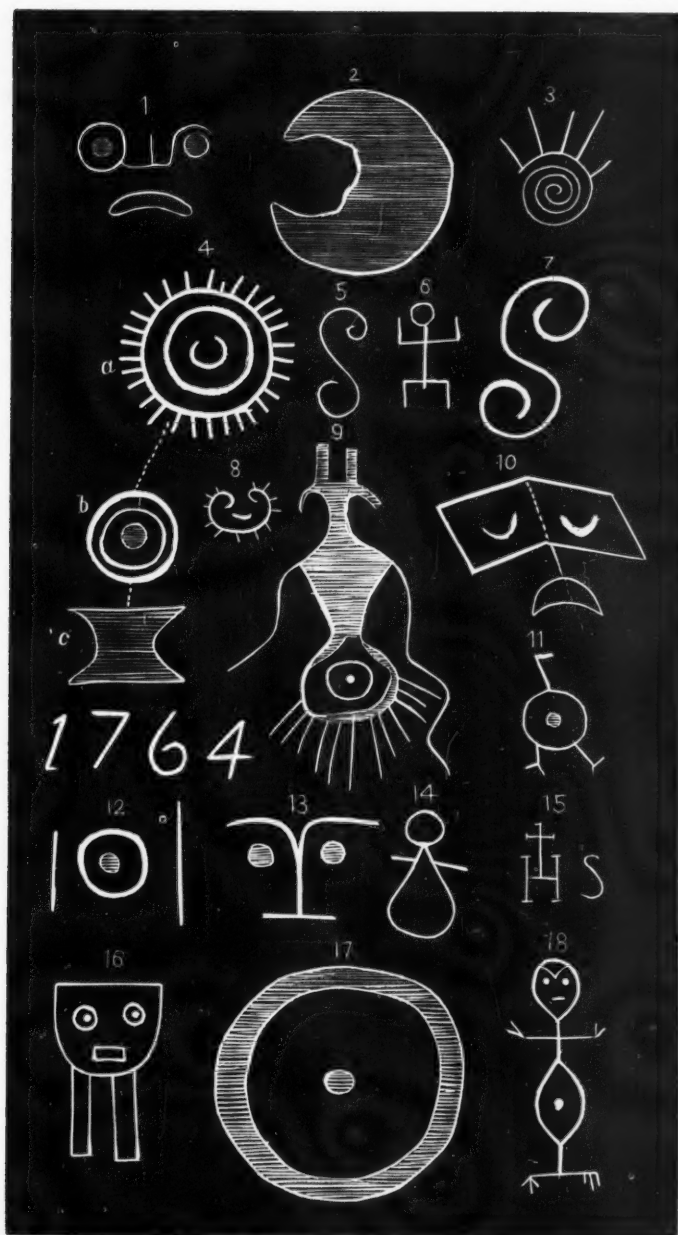
ENGRAVED FIGURES LOWE TOCANTINS.

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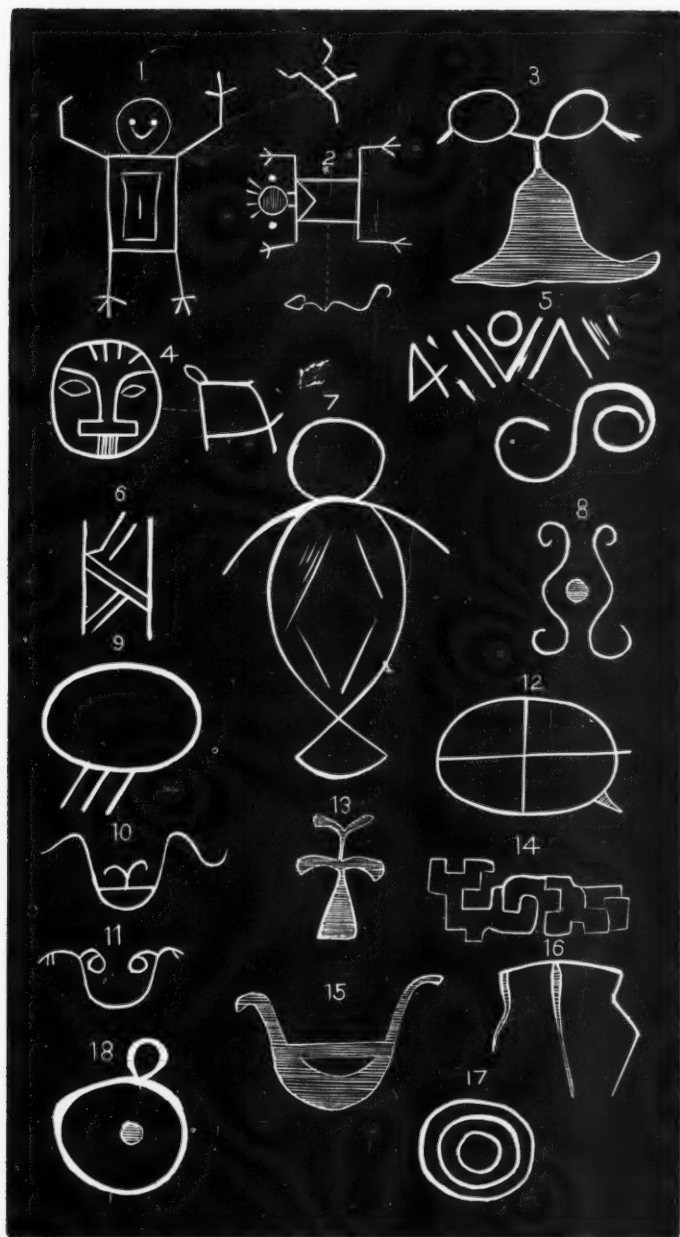


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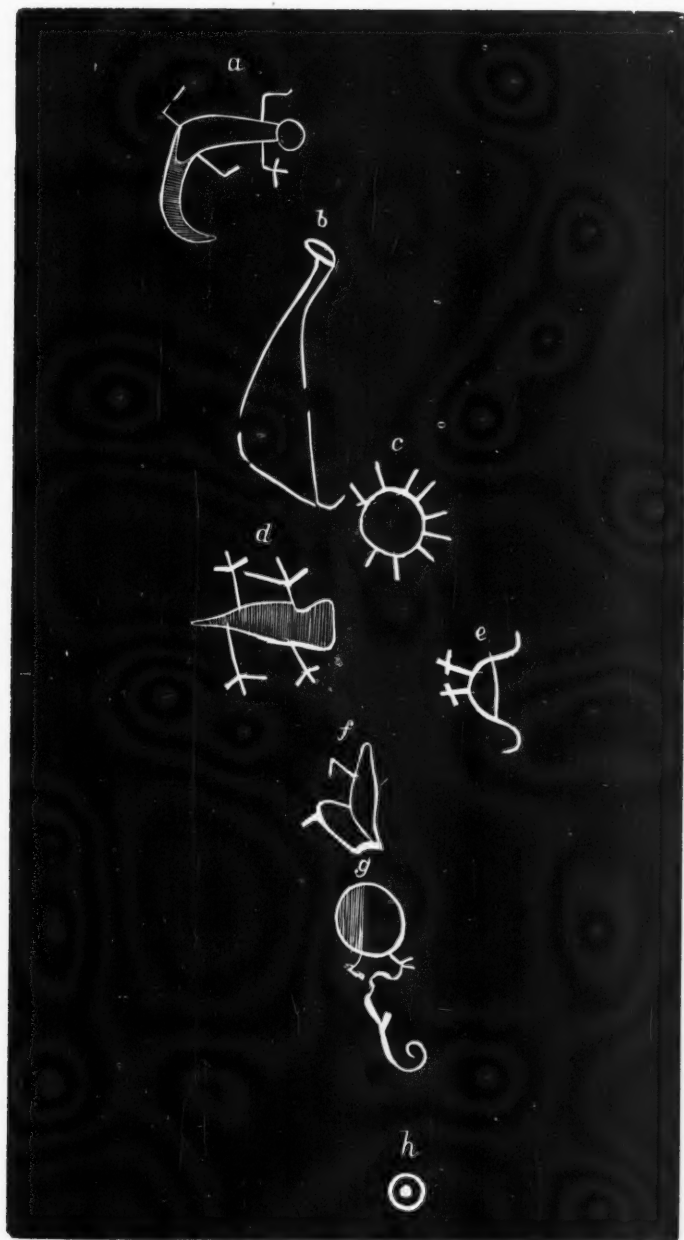


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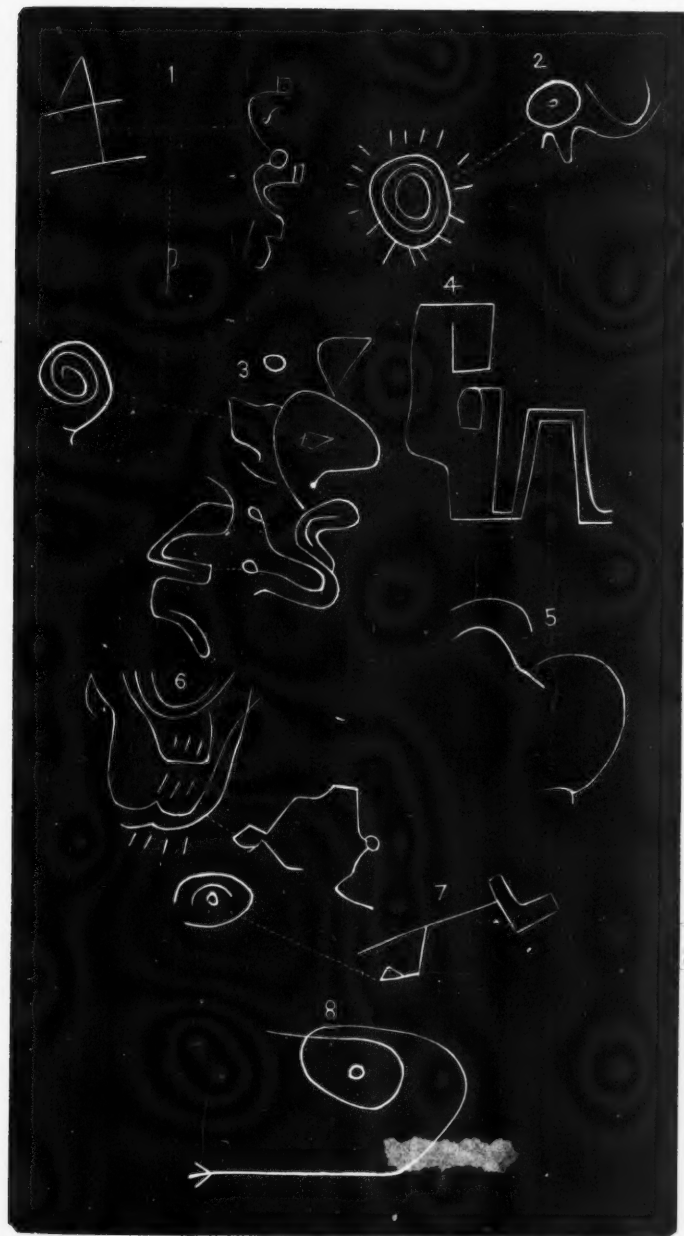
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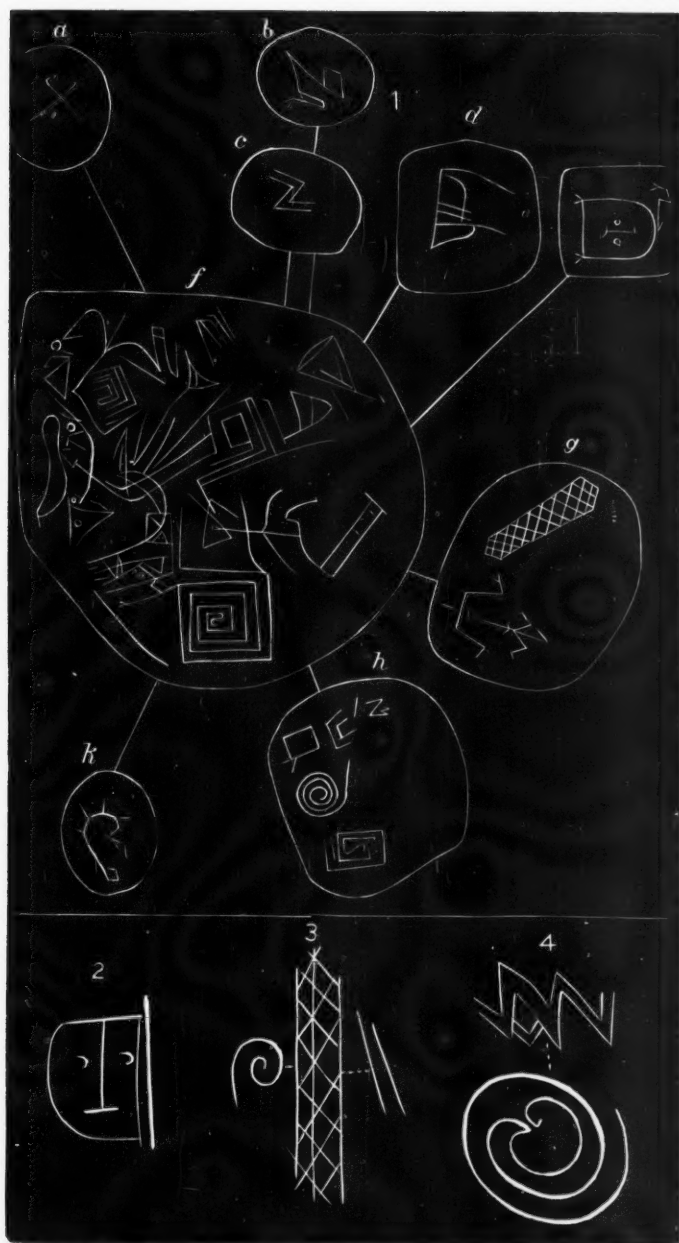
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ROCK INSCRIPTIONS. SERRA DA ESCAMA OBIDOS.

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ROCK INSCRIPTIONS, MONT D'ARGENT, RIO OYAPOCK.

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have attached a great importance to these natural objects, and I think that these figures point to a worship of the sun by the tribes which executed them. The clustering of the inscriptions in prominent places, and especially on and in the vicinity of the rock tower at Ereré, seems to me to indicate that these places had something of a sacred character and were often resorted to. Many of the figures seem to be the capricious daubings of visitors, as, for instance, the human faces drawn on angular rock projections. Some of the animal forms may have had a sacred character.

I know of no trace of sun worship among the uncivilized Indians of Pará to-day, nor do they make rock paintings or inscriptions. The greater part of the Brazilian Indians, such as the Tupís, Botocudos, etc., appear to have had no idea of a God, and no form of worship. We have no historical account of the practice of sun worship among the ancient Indians of the Amazonas. In the burial stations of Marajó small clay figures occur which appear to be idols. The probabilities are, that the tribes anciently inhabiting the Amazonas were more advanced in religious ideas than those Brazilian Indians of which history gives us an account.

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#### DR. KOCH'S MISSOURIUM.

BY P. R. HOY, M. D.

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IX March, 1840, I visited the spot on the Pomme de Terre, Benton county, Missouri, where Dr. Koch had recently disinterred the skeleton of that large male Mastodon now in the British Museum, which the Doctor mounted and named *Missourium tetracaulodon*. Owen subsequently remounted the specimen and made a *Mastodon giganteus* out of Dr. Koch's distorted work.

The excavation was about fifteen feet in diameter and six feet deep, half filled with water. I was told by one of the men who assisted in the excavation, that they did not get all the bones out, as the water was so deep as to interfere materially with their work. So I hired a negro to go into the pit and fish about, while I from the bank, felt around with a hoe. In this way we succeeded in procuring one molar tooth, two pieces of a tusk, and

several pieces of the skull, long bones, etc., etc. The larger piece was from the base of the left tusk, two feet in length, and flattened on the inner side, evidently produced by the friction of his trunk. This specimen retains the fine polish as perfectly as when worn by the living animal. This interesting specimen I recently presented to the Academy of Science of Chicago.

Dr. Koch's report, in the "Proceedings of the St. Louis Academy of Science," is unreliable in every particular, saving the locality. The Doctor certainly exercised a lively imagination when he stated that "the bones were found in a layer of vegetable mould which was covered by twenty feet in thickness of alternate layers of sand, clay, and gravel," and that under this extensive stratification he found the identical flint arrowhead that the *Mound builders* used in slaying this giant of past ages, taking advantage of his helplessness, being mired hopelessly !!!

This skeleton was discovered by a man who scooped out a hole in the "lick" for the purpose of obtaining drinking water. He struck upon the scapula at a depth of *two feet*. This discovery was reported to Dr. Koch, at Warsaw, and he visited the locality and secured the prize.

I am pained to record this evidence of Dr. Koch's want of accuracy in this matter, but the cause of science seems to demand the truth. Dr. Koch's report has been quoted in proof of the antiquity of man. The position and state of the bones rather go to show that the Mastodon lived in an age not so remote as usually supposed. I should not be surprised if the evidence were speedily found to prove that man was contemporaneous with the Mastodon, but, certainly, the *Missourium* affords none.

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## FLYING SPIDERS.

BY J. H. EMERTON.

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ONE of the most curious habits of spiders is that of flying, as it is often called. This has no resemblance to the flight of birds or butterflies, for spiders have no wings nor any organs which could answer the purpose of wings. Their ability to rise in the

atmosphere depends entirely upon currents of air acting upon their bodies or upon threads of cobweb attached to them. By this means they are blown about like the down of thistles or any light objects, rising sometimes to a great height and again, upon a change of weather, falling, often far from the place whence they rose.

In the autumn of 1870 I received a letter from an officer on one of the United States vessels, in which he stated that one day while at anchor near Montevideo, after a strong wind, the rigging was filled with cobwebs, and little spiders dropped down on all parts of the deck.

Mr. Darwin, when in the same region during the voyage of the *Beagle*, several times noticed the same occurrence. He says in his narrative of that voyage: \*—

"On several occasions, when the vessel has been within the mouth of the Plata, the rigging has been coated with the web of the gossamer spider. One day (November 1st, 1832) I paid particular attention to the phenomenon. The weather had been fine and clear, and in the morning the air was full of patches of the flocculent web, as on an autumnal day in England. The ship was sixty miles from the land, in the direction of a steady though light breeze. Vast numbers of a small spider, about one-tenth of an inch in length, and of a dusky red color, were attached to the webs. There must have been, I should suppose, some thousands on the ship. The little spider, when first coming in contact with the rigging, was always seated on a single thread, and not on the flocculent mass. The latter seemed merely to be produced by the entanglement of the single threads. The spiders were all of one species, but of both sexes, together with young ones. . . . . While watching some that were suspended by a single thread, I several times observed that the slightest breath of air bore them away out of sight, in a horizontal line. On another occasion (Nov. 25th) under similar circumstances, I repeatedly observed the same kind of small spider, either when placed, or having crawled, on some little eminence, elevate its abdomen, send forth a thread, and then sail away in a lateral course, but with a rapidity that was quite unaccountable. I thought I could perceive that the spider, before performing the above preparatory steps, connected its legs together with the most delicate threads, but I am not sure whether this observation is correct.

"One day at Santa Fé I had a better opportunity of observing similar facts. A spider, which was about three-tenths of an inch

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\* Journal of the Voyage of the *Beagle*, p. 187.

in length, and which, in its general appearance, resembled a Citi-grade (therefore quite different from the gossamer spider), while standing on the summit of a post, darted forth four or five threads from its spinners. These, glittering in the sunshine, might be compared to rays of light. They were not, however, straight, but in undulations like a film of silk blown by the wind. They were more than a yard in length and diverged in an ascending direction from the orifices. The spider then suddenly let go its hold and was quickly borne out of sight. The day was hot and apparently quite calm; yet under such circumstances the atmosphere can never be so tranquil as not to affect a vane so delicate as the thread of a spider's web. If during a warm day we look either at the shadow of any object cast on a bank, or over a level plain, at a distant landmark, the effect of an ascending current of heated air will almost always be evident, and this probably would be sufficient to carry with it so light an object as the little spider on its thread."

In Temple's Travels in Peru\* it is mentioned that, when sailing up the river Plate, "the rigging of the ship, from top to bottom, was literally covered with long, fine cobwebs that had been blown off the shore, having attached to them their insect manufacturers, who dispersed themselves in thousands over the deck."

Such showers of cobwebs are common in Europe, especially in the autumn. They are said to be usually preceded by a great quantity of web upon the ground, which afterwards rises, and when the wind changes, or the sun begins to go down, falls again.

Mr. Blackwall,† who has devoted many years to the study of English spiders, gives the following interesting account of one of these showers of gossamer:—

"A little before noon on the 1st of October, 1826, which was a remarkably calm, sunny day, the thermometer in the shade ranging from 55° to 64°, I observed that the fields and hedges in the neighborhood of Manchester were covered over, by the united labors of a multitude of spiders, with a profusion of fine glossy lines, intersecting one another at every angle and forming a confused kind of network. So extremely numerous were these slender filaments, that in walking across a small pasture, my feet and ankles were thickly coated with them. It was evident, however, notwithstanding their great abundance, that they must have been produced in a very short space of time, as early in the morning they were not sufficiently conspicuous to attract my notice, and on the 30th of September they could not have ex-

\* Temple's Travels in Peru, Vol. i, p. 49.

† Researches in Natural History, 1832. Linnæan Transactions, Vol. xv.

isted at all; for, on referring to my meteorological journal, I find that a strong gale from the south prevailed during the greater part of the day. A circumstance so extraordinary could not fail to excite curiosity; but what more particularly arrested my attention was the ascent of an amazing quantity of webs of an irregular, complicated structure, resembling ravelled silk of the finest quality and clearest white. They were of various shapes and dimensions, some of the longest measuring upwards of five feet in length and several inches in breadth in the widest part; while others were almost as broad as long, presenting an area of a few square inches only. These webs, it was quickly perceived, were not formed in the air, as is generally believed, but at the earth's surface. The lines of which they were composed, being brought into contact by the mechanical action of gentle airs, adhered together till, by continual additions, they were accumulated into flakes or masses of considerable magnitude, on which the ascending current, occasioned by the rarefaction of the air contiguous to the heated ground, acted with so much force as to separate them from the objects to which they were attached, raising them into the atmosphere to a perpendicular height of at least several hundred feet. I collected a number of these webs about midday, as they rose, and again in the afternoon, when the upward current had ceased to support them, and they were falling; but scarcely one in twenty contained a spider, though on minute inspection, I found small winged insects, chiefly aphides, entangled in most of them.

"From contemplating this unusual display of gossamer, my thoughts were naturally directed to the animals which produced it; and the countless myriads in which they swarmed created almost as much surprise as the singular occupation that engrossed them. Apparently actuated by the same impulse, all were intent upon traversing the region of air; accordingly, after gaining the summits of various objects, as blades of grass, stubble, rails, gates, etc., by the slow and laborious process of climbing, they raised themselves still higher by straightening their limbs, and elevating the abdomen by bringing it from the usual horizontal position into one almost perpendicular, they emitted from their spinning apparatus a small quantity of the glutinous secretion with which they fabricate their silken tissues. This viscid substance being drawn out by the ascending current of rarefied air into fine lines several feet in length, was carried upwards, until the spiders, feeling themselves acted upon with sufficient force in that direction, quitted their hold of the objects on which they stood, and commenced their journey by mounting aloft. Whenever the lines became inadequate to the purpose for which they were intended, by adhering to any fixed object, they were immediately detached from the spinners by means of the last pair of legs and became converted into terrestrial gossamer, and the proceeding just described was repeated."

I do not know of any published account of similar flights of cobwebs in this country, but on almost any fine morning in summer the grass and shrubs may be found covered with threads connecting the extremities of the twigs and leaves in every direction, and floating horizontally from them sometimes to a distance of several yards. I have often seen the short grass in the Salem pasture so covered that every leaf seemed to have several threads passing from it. One morning in June, 1868, I noticed some little spiders about one tenth of an inch long rambling about on the top of a low fence partly shaded by horse-chestnuts and apple-trees. At intervals they would stop, raise the back part of their bodies, and straighten their legs until they stood on tip-toe in the ridiculous position shown in the figure. (Fig. 43.) After a few seconds they would retake their customary position and travel on. I went to the same fence and watched them on several successive

Fig. 43.



mornings, and finally saw one, on the edge of the fence-cap, raise itself as in the figure and immediately after a thread extended upward from its spinners. In a few seconds the thread increased to nearly a yard in length, when spider and all rose slowly upward until the thread became entangled in the branches of the apple-tree above, which were already connected together by numerous threads and occupied by several spiders of the same kind. This took place soon after sunrise on a warm, and apparently perfectly calm morning.

At another time, on one of the first warm days in March, I saw a little crab-spider running about on the ends of a barberry bush and dropping from twig to twig until it hung from the most projecting branch by a thread about a foot long. It swung back and forth for some minutes when a gust of wind blew it away so quickly that I could not follow it with my eyes. It had, however, spun a thread as it went which passed from the bush to a juniper about six feet off.

Mr. R. P. Whitfield of Albany, N. Y., tells me that once when passing through a field of oat stubble on a warm day in autumn, he observed great numbers of threads floating upwards in the air, the lower extremity being attached to the upper ends of the stubble, and on examining some of the stalks he found numbers of small spiders busily running up and down them. When a suitable place was found the spider would attach a thread to the

upper end of the stalk and then descend one or two inches and return, allowing the air to carry upward the loose thread. At the same time it elevated its abdomen and the current, acting on the loop already formed, drew out the thread from the spinnerets until a sufficient quantity had passed, when it broke off the end attached to the stalk and floated away with the web. In this way he observed several individuals ascend. At the time there was no perceptible current in the atmosphere except the upward current caused by rarefaction.

In the autumn of 1865, in Northwestern Iowa, passing along the smooth surface of the river in a boat, he observed something crossing the river with a skipping motion, striking the surface of the water at irregular intervals. Looking about he saw that the same thing was taking place at other points. Upon intercepting one, which he had watched almost from the opposite bank, he found it to be a small spider (*Attus*), from the abdomen of which threads of web extended several feet into the air, by which it was floated along. As it crossed the water, the air being cooler, it had descended, allowing the spider to touch the surface of the river.

To account for the ascent of threads and spiders various theories have been proposed. It was formerly supposed that the threads were thrown out from the spider as water is from a syringe, independently of any outside force, and that the threads were afterwards blown into the air carrying the spider with them.

Some have thought that the spiders actually flew in the air without help from webs or from the wind, using their legs as wings.\*

Mr. Murray† believed that a spider could shoot its threads in any direction without reference to the wind. He says:—

“Contrary to the assertion that ‘spiders have no power of propelling their webs without assistance from the wind,’ I fearlessly assert that they can do so in an atmosphere in which the very leaf of the aspen remains motionless; and although their *char volant* obeys the direction of the breeze, this simple fact proves nothing in favor of the opinion of Mr. Blackwall. The *aéronautic* spider can propel its threads both horizontally and vertically and at all relative angles, in motionless air, and in an atmosphere agitated by winds; nay, more, the *aërial* traveller can even dart its thread, to use a nautical phrase, in the ‘wind’s eye.’ My opinion and observations are based on many hundreds of experiments. On

\*J. J. Virey, *Ferussac’s Bulletin Sciences Naturelles*. Tom. viii.

†*Memoirs Wernerian Soc.*, Vol. v, pt. 2, 1826; and *London’s Mag. Nat. Hist.*, Vol. i, 1829.

favorable occasions I am constantly extending their amount, and as often do I find my deductions supported, namely, that the entire phenomena are electrical. In clear, fine weather the air is invariably positive; and it is precisely in such weather that the *aëronautic* spider makes its ascent most easily and rapidly, whether it be summer or winter. I have often seen this in winter, during an intense frost, a circumstance which renders the action of warm currents of air, as accessory to its flight, something more than questionable. Our *aëronaut* may be met with in its descent over the *Mer de Glace* as well as over the Lake of Geneva; and it will take flight as readily from a point over the frozen sea as from the heated surface soil of the valley of Chamouny.

"Several circumstances concur to shew the phenomena of ascent to be electric. The propelled threads do not interfere with each other; they are divellent, and this divergence seemed to proceed from their being imbued with similar electricity, and the character of that electricity appeared to me to be an interesting subject for subsequent research. . . . . When a metallic conductor is brought near to the suspended spider, it disarranges its projectiles, and the insect, conscious of some counteracting agency, coils up its threads.

"When a stick of sealing-wax is brought near the thread of suspension, it is evidently *repelled*, consequently the electricity of the thread is of a negative character. The descent of the thread is instantly determined by bringing over it the excited sealing-wax; and if strongly excited, and the spider let fall on its surface, it bounds from it with considerable energy. On the 3d of July, 1822, at 4 P. M., thermometer 66° Fahr., two *aëronautic* spiders, on separate threads, were brought near to each other; a mutual repulsion supervened; and when one was brought in momentary contact with the other, it immediately fell lower in the perpendicular plane.

"An excited *glass* tube brought near, seemed to *attract* the thread, and with it the *aëronautic* spider. When the insect was thus *positively* electrified, the rapidity which marked its descent, and extent of thread spun out, and which I frequently coiled up, was truly astonishing, being at least 30 feet in length."

The manner in which the thread starts from the body is difficult to determine, on account of the small size of the spiders. One theory is that the spider must attach one end of its thread to a fixed object, so that the wind may have a loop to blow against. Some think it more probable that a small quantity of gummy material is emitted from the spinnerets and drawn into a thread by the current;\* others, that the spinnerets of opposite sides are

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\* Rennie's Insect Architecture, p. 381.

brought in contact and then drawn apart, forming a little web between them which offers enough surface to the wind to be blown away, carrying out the thread with it.

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## REVIEWS.

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GRAVE-MOUNDS AND THEIR CONTENTS.\* — In this concise and remarkably interesting little volume, made doubly valuable by its 489 wood cuts, which show that the author took pencil and engraver to his work as well as his pen, pick, and spade, the student in archaeology will find much to instruct and aid him in his labors.

The author calls attention to the fact that the grave-mounds of most ancient date are found in the mountainous districts, while those of a later time, though in part associated with the earlier mounds, are spread throughout the country.

In this country the term *mound* has been almost universally given to all our ancient tumuli, and to an American reader the multiplicity of British terms in common use for the same kind of ancient works is at first confusing. Hence, while the term *barrow* is in general use, *tump* is given as the synonyme in Gloucestershire, *hone* in Yorkshire, and *low* in Derbyshire, Staffordshire, etc. The term *low* is so universal in some districts, that about two hundred places in Derbyshire alone have the affix of "low," this affix being a sure indication that a "mound" exists or has existed in the immediate vicinity.

In the second chapter our author gives an account of the construction of the mounds and the various modes of burial, both by inhumation and cremation. In the former, the bodies were most usually placed in a contracted position, lying generally on the side with the hands in front of the face and the knees drawn up, though almost every other position of the body, such as sitting, kneeling, or extended, has been noticed. In burial by cremation, the bones left after the burning of the body were gathered up and

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\* A Manual of Archaeology, as exemplified in the Burials of the Celtic, the Romano-British, and the Anglo-Saxon Periods. By Llewellynn Jewitt, F.S.A., etc. With nearly five hundred illustrations. London: Groombridge and Sons, 1870. 12mo, pp. 306, cloth, full gilt.

either placed in a small heap, sometimes "covered with a small slab of stone, or wrapped in cloth or skin (the bronze pin which fastened the napkin being occasionally found), or enclosed in cinerary urns, inverted or otherwise. In some instances, even when placed in urns, they were first enclosed in a cloth." In regard to the disputed point as to the form of the barrows, "long barrow," "round barrow," etc., which some authors have considered as indicating a difference of race in the occupants, and have even gone so far as to give as a rule, "long barrows, long heads, and round barrows, round heads," our author's observations lead him to the following conclusions :—

"An examination of a very large number of barrows leads me to the opinion that the original form of all was circular, and that no deviation from that form and no difference in section, can be taken as indicative of period or of race."

In the third chapter, in giving an account of the places where the burning of bodies has taken place, he says that :—

"Wherever the burning has taken place, there is evidence of an immense amount of heat being used; the soil, for some distance below the surface, being in many places burned to a redness almost like brick. Remains of charcoal, the refuse of the funeral pyre, are very abundant, and in some instances I have found the lead ore, which occurs in veins in the limestone formation of Derbyshire, so completely smelted with the heat that it has run into the crevices among the soil and loose stones. . . . Is it too much to suppose that the discovery of lead may be traced to the funeral pyre of our early forefathers? I think it not improbable that the fact of seeing the liquid metal run from the fire as the ore which lay about became accidentally smelted, would give the people their first insight into the art of making lead."

The several facts that have been brought forward to prove that the earliest races of men were, if not habitually, occasionally cannibals, have, perhaps, not been so very conclusive as to secure general belief, but the testimony that the early races indulged to a very extensive degree in the equally degrading custom of human sacrifice has accumulated to such an extent, that it can now hardly be doubted that all races which have risen to a state as high, even, as "semicivilized," have passed through the stage of human sacrifice. That the ancient Britons were no better than the ancient Americans in this respect is suggested by the following sentence from Mr. Jewitt's work :—

"It is frequently found in barrows, where the interment has been by cremation, that there will be one or more deposits in cinerary urns, while in different parts of the mound, sometimes close by the urn, there will be small heaps of burnt bones without any urn. The probable solution of this is, that the simple heaps of bones were those of people who had been sacrificed at the death of the head of the family, and burned around him."

Much has been written, and many popular superstitions are extant, regarding the Stone, or "Druidical" Circles, and Cromlechs, or "Druid Altars." These our author disposes of, at least in part, by considering the smaller circles to be simply the outline or commencement of the mound raised over the place of burial, and the cromlechs as sepulchral chambers, denuded of the earth that once formed a mound over them. That such is the case, his own and other excavations seem most conclusively to show, but while thus reducing popular superstition to simple facts, the mystery as to the means by which the, in many instances, gigantic cromlechs were erected, is left, and it is nearly as great a one as the building of the pyramids.

In this notice we have called attention to only a few of the points treated of by Mr. Jewitt in the first chapters of his little book, relating especially to the Ancient British, or Celtic Period. He also gives an equally instructive account of more recent mounds and burials under the headings of the Romano-British and the Anglo-Saxon Period, thus bringing archaeological research well into the domain of history, and in many instances getting from the graves of the dead facts with which to elucidate the history of the living.

CRUSTACEA DREDGED IN THE GULF STREAM OFF FLORIDA.\* — The rich materials dredged by M. Pourtales, in the Gulf Stream, under the auspices of the United States' Coast Survey, are gradually being published in the Bulletin of the Museum of Comparative Zoology at Cambridge. The brachyurus Crustacea, of which many new forms, both generic and specific, were discovered, are now enumerated by Dr. Simpson, with notes on their bathymetrical distribution, though most of the species were from shoal water. In a second part, the general result will be given, to which we shall allude when issued.

\*Preliminary Report on the Crustacea dredged in the Gulf Stream in the Straits of Florida; by L. F. de Pourtales. Part I. Brachyura. Prepared by Dr. William Simpson. 8vo. pp. 109-160. Cambridge, 1870.

THE RECORD OF ENTOMOLOGY for the year 1870 will be soon issued, and it is hoped that subscribers to the previous parts will feel inclined to support this undertaking another year.

SYNOPSIS OF EUROPEAN COLEOPTERA DESCRIBED IN 1868.\*—This is a most convenient work for European coleopterists, and is of considerable value to American entomologists. Each species, described as new, is briefly characterized in Latin, so that entomologists of every nationality can read it. When will the time come for the publication of a similar yearly synopsis in America for all the insects?

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## NATURAL HISTORY MISCELLANY.

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### BOTANY.

THE JARDIN DES PLANTES, PARIS: *Feb.* 20.—To-day we drove round to the house of M. Decaisne, whose celebrity as a botanist is too well known for any further comment to be necessary, and under his kind and most interesting guidance I visited a scene which was full of painful interest. The gardens had apparently been a point of especial bombardment, and no fewer than eighty-three shells had fallen within their comparatively limited area. We went out to the glass-houses to judge for ourselves of the effects. On the nights of January 8th and 9th, four shells fell into the glass-houses and shattered the greater part of them into atoms. A heap of glass fragments, lying hard by, testified to the destruction, but the effect of the shells was actually to pulverize the glass, so that it fell almost like dust over the gardens. The consequence was that nearly the whole of this most rare and valuable collection was exposed to one of the coldest nights of the year, and whole families of plants were killed by the frost. Some of the plants suffered the most singular effects from the concussion; the fibres were stripped bare, and the bark peeled off in many instances. One house into which we went presented a most lamentable appearance of bare poles; scarcely a leaf was left.

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\* Synopsis Coleopterorum Europæ et Confinium, anno 1868, descriptorum. Auctore, G. R. Crotch, M. A. London: Williams & Norgate, 1870. 8vo. pp. 68.

All the Orchids, all the Clusiaceæ, the Cyclantheæ, the Pandaneæ, were completely destroyed, either by the shells themselves or by the effects of the cold. The large Palm-house was destroyed, and the tender tropical contents were exposed to that bitter cold night; yet, singularly enough, although they have suffered severely, not one has yet died. Imagine Kew Gardens under a heavy fire, and Dr. Hooker standing disconsolate in the midst of them, his most cherished plants in ribands, and his glass-houses a mass of powder, and we can form some idea of what M. Decaisne suffered during those fifteen nights, when shells came bursting under his windows, sending splinters into his flower garden and shaking his house to its foundations with every explosion. Feeling that, at all costs, he was bound to stick to his post, he passed the whole of his time actively engaged in covering up his plants in blankets, and straining every nerve to keep the cherished favorites of a lifetime from the ruthless missiles that were searching every nook and corner of the establishment. Two shells fell into the zoological gallery, one into the gallery of mineralogy, where it destroyed some beautiful pieces of palæontology. Three fell into the laboratories and museum, destroying a valuable collection of rare shells, which had just been classified. The houses, historical as having been the residences of Cuvier and Buffon, did not escape, but fortunately, although several of the shells were found to be full of combustible material, nothing was set on fire. All through the whole of the fortnight during which these gardens were subjected to this rain of shells, Messrs. Decaisne, Chevreuil, and Milne-Edwards remained at their post, unable to rest, and have since, at their own expense, repaired the damage done, trusting that, whatever form of government France may choose, it will not repudiate its debt of honor. The British public have nobly come forward to relieve the distress of the suffering population of Paris; I would now make an appeal to the comparatively small section of society whose glass-houses may perhaps be supplied with plants which may replace those which have been destroyed. M. Decaisne is making out a list of his losses, a large proportion of which might possibly be supplied from Kew, while owners of private collections might also be glad to testify their sympathy and interest in the cause of science by contributing whatever they may be able to spare as soon as the amount and nature of the loss is ascertained. I feel no doubt that it will be enough to make the facts known for

the British public to respond with the same generosity which they have manifested in other instances. The animals fared better than the plants — not only have none of them been eaten by the population of Paris, as the latter fondly suppose, but, although several shells burst among them, they have escaped uninjured. Of course, when food was so scarce for human beings, the monkeys and their companions were put upon short allowance. This fact, coupled with the extreme rigor of the season, increased the rate of mortality among them, and one elephant died, but was not eaten. The two elephants and the camel, that were eaten, belonged to the Jardin d'Acclimation, and had been removed in the early stage of the siege from their ordinary home in the Bois Boulogne, for safety, to the Jardin des Plantes, where, however, it would appear, it was not to be found. The birds screamed and the animals cowered, as the shells came rushing overhead and bursting near them, as they do when some terrific storm frightens them; latterly, they seemed to become used to it; fortunately, the part of the garden which they inhabit is somewhat removed from the museums, at which the fire seemed more especially directed. The gates of this favorite resort were kept closed, because the price of firewood is so high, and the scarcity of it such, that the people are unable to resist the temptation of coming into the gardens in search of fuel, and, for the present, it is found wise to shut them out; indeed, so much greater is the necessity for fuel than for food at present, that the provision trains have been stopped by order of the Government to allow the coal trains to pass. — *Special Correspondent of "The Times," quoted in the "Gardeners' Chronicle."*

ASCENT OF THE SAP IN PINES. — Some years ago, my gardener pointed out to me that some Austrian and Scotch Pines, which had been completely girdled by mice, still continued to grow, as if no such injury had been received. In order to test this matter, I took an Austrian Pine about five feet high, and girdled it for a space of two inches, at about three feet from the ground. This was five years ago, and the upper portion is still alive. The tree attracts much attention from visitors to my grounds. When girdled, the branch was about one and one-half inches in diameter. The whole portion of stem between the tier of branches above, and that below — a space of about fifteen inches — has since remained of that size, and is dry and hard as a "pine knot." The

parts above and below this dead space increase annually in girth. The upper portion is now about nine inches in circumference. There are branches above and below the girdled portion; the lower ones growing much the stronger. The upper portion makes only two or three inches of growth a year, and the "needles" are of a brighter green than the lower. — THOMAS MEEHAN.

DIMORPHISM IN DEUTZIA. — My friend, Edward Tatnall, of Wilmington, Del., once called my attention to the fact that there appeared to be two kinds of flowers on the *Deutzia gracilis*, a dwarf shrub now common in gardens. I have a plant now in flower by forcing in a greenhouse. One class of flowers is of normal form, with well developed pistils, and the ten stamens with their somewhat petaloid filaments. The other class has the pistils scarcely developed; the anthers seem quite as large and as perfect as in the others, but are quite destitute of filaments. I cannot tell with certainty whether this is an arrangement for cross-fertilization of separate flowers, because the anthers in the hermaphrodite flowers, as we suppose them to be, appear perfect; but when the season comes for observing the flowers in the open ground, May or June, no doubt the facts could be definitely ascertained. I make note of these little things now, so that botanical students can observe for themselves when the time comes round. — THOMAS MEEHAN.

CONTRIVANCE IN THE COROLLA OF SALVIA INVOLUCRATA. — In most *Salvias*, part of the anther develops into a lever which closes the throat, and, when lifted by an insect, causes the pollen to be thrown on its back. Some suppose, and with apparent good reason, that this is to aid in cross-fertilization. In *Salvia involucrata*, the lever arrangements are remarkably well developed, but the arched upper lip curves inward, and prevents the anthers from acting in the manner above described. It would seem as if the plant, after "making" its arrangements for cross-fertilization, "repented," and "made" another to contradict it. — THOMAS MEEHAN.

ALBINO FLOWERS. — During the summer of 1869 I observed, in the University campus, quite a number of specimens of *Trifolium pratense*, with perfectly white flowers. During the past season, although I searched diligently, I was not able to find any white flowers of that species, not even upon stalks which I believe to

have sprung from the same roots that bore the white flowers observed the year previous, they having apparently resumed their specific color.

During the autumn of 1868 I discovered in Northern Iowa a specimen of *Liatris cylindrica* with perfectly white flowers, all the flowers upon the three stalks from the same root being white. This seems more remarkable than that of the white clover mentioned, because the usual color of the latter is at best only specific, while rose-red is regarded as the invariable color of all the species of *Liatris*. In other words, the color is a generic character. — C. A. WHITE.

[We print this notice, with the remark, once for all, that occasional white flowers may be expected in any species, so that it is hardly worth while to specify numerous particular instances. — Eds.]

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## ZOOLOGY.

POISON OF THE COBRA. — At the meeting of the Boston Society of Natural History, January 18th, Mr. George Seeva gave the results of an experiment which he had recently made in connection with Dr. Thomas Dwight, Jr., with the poison of the Cobra di Capello, *Naja tripudians*.

January 8th, one quarter of a grain of the dried poison, which had been kept a little more than seven months, was put into twenty drops of water, the poison dissolved, and the liquid reduced by evaporation at a temperature of 85° F., to four drops. This was exposed to the air at a temperature of 22°, and was completely frozen in four minutes, the warmth of the porcelain vessel retarding the process slightly. The poison was allowed to remain in the frozen state for sixteen hours, during which time the temperature fell to 8°, or 24° below the freezing point. On the following day, January 9th, the poison was thawed and diluted with three or four drops of water, and two drops of the liquid injected with a fine-pointed syringe into the pectoral muscle of a pigeon, about half an inch from the keel of the sternum, the point of the syringe penetrating the muscle about one eighth of an inch. This part of the pigeon's body was selected in order to avoid wounding any of the viscera or large blood vessels.

The poison was injected at 4.32 P. M. At 4.34 there was a motion of the bowels. Although this almost invariably occurs, as the first symptom of the action of the poison in the lower animals, yet it cannot be fully relied on in the case of birds, as it frequently occurs from fright.

At 5.10 another motion of the bowels, followed by slight tremors and convulsive movements, clearly indicating the action of the poison.

At 5.15 no further symptoms of importance appeared. At this time he left the room for about two hours, and on returning, at a few minutes past 7, found the pigeon dead; its death having occurred in less than two hours and a half from the time of being poisoned.

Mr. Seeva then made some general remarks on the habits of the Cobra, and on the action of its poison. He said he had been much surprised, in looking over some works on natural history, at the erroneous statements on this subject which many of them contained. He thought these errors might be attributed, in a great measure, to the general aversion which people felt for all poisonous reptiles. This seems to account, when combined with the usual credulity shown in such matters, for the many strange stories and absurd reports that had been published of the poisonous snakes of distant countries, such as India; and in many instances he had found that men holding high positions in the Government civil service and physicians residing in that country, had published statements which had been accepted here and in Europe, as facts well established by their personal observations and careful investigations; whereas they were founded merely on the stories told by the jugglers, snake-charmers and other ignorant people. In some popular works on natural history recently published, which on many subjects appeared to be carefully written, there seemed, in this matter, a great want of careful discrimination. In J. G. Wood's "Natural History of Reptiles," several pages were devoted to accounts of antidotes, such as the leaves and roots of the *Aris-tolochia Indica*, the "Snake Stone," etc. These, with a great many other reputed antidotes, had been found by recent investigation to be utterly worthless.

Mr. Seeva, during the past three years, while attached to the Indian Museum at Calcutta, had assisted Dr. Fayer, the Professor of Surgery in the Medical College there, in his numerous ex-

periments with the venom of poisonous snakes. Among those made to test the value of local applications was that of the actual cautery by plunging pointed red-hot irons deeply into the flesh in the places where the fangs had entered, but this failed to destroy the poison.

This result, however, would not surprise one who fully understood the rapidity with which the blood passes through the soft tissues of the body, and the instantaneous action of the poison upon it.

To show the rapid effect of the poison on the blood, Mr. Sceva read one of Dr. Fayrer's experiments that he had witnessed, in which the inguinal fold of the skin of a dog was held by two pairs of long-bladed forceps in such a manner as to include a triangular piece of about three inches in length. The Cobra's fangs were applied to the middle of the free edge, and with a sharp scalpel, held in readiness, the fold of skin was at once cut out, and yet the dog died from the effects of the poison in fifty-nine minutes. Dr. Fayrer, in his report, made the following comments:—

"This was a very interesting and instructive experiment, most clearly demonstrating the deadly nature of the virus and the awful rapidity with which it passes into the circulation. The bitten part was not merely excised, as we speak of excising the parts around the spot which the fangs had penetrated, but the fold of skin into which the fangs had injected the poison was removed within a second after the bite; for the knife had entered almost before the fangs had left. In fact, it could not have been done more rapidly, and yet, within one hour, the animal was dead from the effects of the poison. The infinitesimal portion of time during which the Cobra's fangs were inserted in the tissues was sufficient to have sent the poison through the circulation beyond the reach of incision, and yet how very small must that portion have been."

Mr. Sceva exhibited on the table a living specimen of the Cobra, which he had brought with him from India. It was about five feet in length, and of the variety known in India as the Keuteah. It had eaten nothing while it had been in his possession (since the 8th of June last), a period of seven months and ten days. He had also kept others in India for over five months without food.

He said the common belief that the Cobra would seek to exercise its deadly power by biting any person who should come within its reach, was quite erroneous. On the contrary, it avoids using its fangs as much as possible, except when securing its food. When

two Cobras were placed together in a cage, they would sometimes strike at each other for hours with their noses, and would blow their venom and saliva from their mouths; but he had never seen one bite another, although he had kept a large number of them in cages convenient for observation.

Of the great numbers of deaths (some thousands) occurring annually from Cobras, the bites were almost always received when people stepped upon them.

Until very recently it was almost universally supposed that the poison of the Cobra had no effect on the mongoose, an animal resembling the weasel. It was well known that the mongoose would attack and kill the Cobra, and would sometimes eat a large part of the body, but in these encounters the mongoose, by his great agility, could easily avoid being bitten; and Mr. Seeva had found, on examining a Cobra which had been killed by a mongoose, that all the wounds had been inflicted back of the head. When, however, the mongoose was secured, and a Cobra was compelled to bite its leg, by having it put into the snake's mouth, the mongoose died in a very short time.

Mr. Seeva added, that since making the experiment with the frozen poison, he had found that a similar one had been made on the venom of the rattlesnake by Dr. S. Weir Mitchell of Philadelphia. Dr. Mitchell also found that neither boiling nor a putrefactive change destroyed its poisonous action. These experiments have also been made with the venom of the Cobra with like results.

DISTRIBUTION OF ANIMALS IN THE SOUTH SEAS. — Having previously explored nearly every South Sea group, I was surprised at the superior richness of the Viti Islands, as compared to the other locations. Of shells alone, I got about fourteen hundred species, and new ones were occurring, up to the time of my departure. I have not the least doubt but that the group will produce six hundred species more. At the Navigators I found nearly eight hundred species. Tahiti produced five hundred. So it is evident that the nearer we approach the East Indies the richer the Islands become in shells. The same rule applies to every other department of Natural History.

Since I have been collecting in the South Seas I have ascertained that nearly every group has some species of marine shells peculiar to that one location, and which do not occur elsewhere.

Again, certain species are abundant at some particular group, and gradually become more and more rare as we recede from their metropolis, or specific centres.

Each group of islands has distinct species of land shells, and, in fact, every island in a group possesses its peculiar species. For small species of land shells, *Stenogyra juncea* and *Vertigo pediculus* range over the South Sea Islands, and are the only exceptions to the rule. What is most surprising, in most cases, is that we find the species confined to particular valleys, or certain parts of the islands. The small islands are generally richer in species than the larger ones. Succineæ, so abundant at the eastern groups, do not occur at the Viti Islands, while the latter possess many species of large Bulimi, belonging to the section Charis and Placostylus, which are not found at the former islands. Another marked feature in the Viti land shells is the large ground species of Navini. Its mangrove swamps swarm with many species of Auriculidæ, and the rivers abound in large Butisse.

Fresh water shells are more widely diffused than land shells. Three of the Tahiti *Neritinae* (*Tahitensis*, *dilatula*, and sp?) occur at Samoa, but not at the intermediate groups. Several species of the Samoa (Navigator Isles) *Neritina*, *Navicella*, and *Melania* are common at the Viti group. The fresh water shells of the Sandwich Islands are all peculiar.

The Viti Islands are extraordinarily rich in Mitridæ and Plenrotomidæ. Of the former I found one hundred and thirty, and of the latter one hundred species.

Most of the Viti fish, crustaceans and echinoderms, are identical with Tahiti species, though many new species were obtained. Nature has been rather chary of her entomological gifts to her eastern groups; but in the Vitis it is quite the reverse. I found a great variety of Lepidoptera and Coleoptera, some of the latter of great size and beauty. *Macrotoma heros*, a beetle, attains a length of four and a half inches, and a large *Dorcus* abounds. The larvæ of both species are considered a delicacy by the natives and relished by some of the foreigners.

At the Vitis I found many new species of reptiles, and, for the first time, met with frogs and land snakes. One lizard, *Brachylophus fasciatus*, attains a length of three feet. Every species of reptile is eaten by the natives.

While I was in the group, the natives killed the Rev. Mr. Baker

and eight native teachers. Cannibalism is still common at the islands, and many parts of the group are too dangerous to explore. — A. GARRETT.

SEXES OF THE LOBSTER. — A Correspondent of "Land and Water," makes an announcement, which is endorsed by the editor of that paper, to the effect that the sex of Lobsters can be readily determined by the character of their claws, since, in nearly fourteen hundred specimens examined, it was ascertained that in the male, the blunt, tufted claw is always on the left side, and the sharpest serrate claw on the right, a condition of things exactly reversed in the female. This, however, has been subsequently denied, and the question of determining the sex by means easily understood by the laity, yet remains open.

OCCURRENCE OF LAND BIRDS FAR OUT AT SEA. — We are indebted to the Smithsonian Institution for the following extract from a letter received from the Hon. L. E. Chittenden, in reference to certain birds which came on board the vessel in which he was proceeding to Europe. Frequent mention is made, in the writings of travellers, of birds having been seen far out at sea; but it is not often that so satisfactory an identification of the species is supplied, as that furnished by Mr. Chittenden's letter.

"STEAMER LAFAYETTE, 12 M., Oct. 19th, 1869.

Latitude  $41^{\circ} 40'$ ; longitude  $64^{\circ} 9'$ ; distance sailed last twenty-four hours, 310 miles. Distance from New York, 589 miles. To Brest, 2441 miles. There has been a strong wind from the northwest the last twenty-four hours. Shortly after daylight this morning, land birds began to alight on the ship. The sailors have caught many, some twenty-five or thirty. They seem very weary and disinclined to move after having alighted, and are easily caught. *They must have been blown off the land*, but it is singular that so many should have been blown away by a wind which is far from being that of a gale. They fly straight to the ship and alight; do not circle around at all. I have been showing the sailors what to feed them with. They have produced several cages, and are having quite an aviary. Among those taken were the following:—Bluebird (*Sialia Wilsonii*); Yellow-bellied Woodpecker (*Picus varius* Wils.); Field Sparrow (*Spizella pusilla* Wils.), several specimens; Chipping Sparrow (*Spizella socialis*); another sparrow, name unknown, but with a white throat, breast and lower part of body yellowish red (probably *Passerella iliaca*); a creeper, probably Brown Tree Creeper. A flycatcher, either the common Pewee or the Wood

Pewee, I think the latter; and two warblers, which I could not recognize, as they were both probably females with no special, distinctive marks."

"This is the entry, with the portions in parentheses added now. The route of the French ships is far to the southward of all the other steamers. You will see from the map that we came about three hundred miles south of Nova Scotia, a rather long flight for the birds. Some of them died, but the greater number fed well, and when we were in Brest harbor I made the sailors set them free. So you may hear of the discovery of several new species in the north of France."

"I told you that I thought there was a robin among the birds that came on board ship; such is my recollection. But it is not mentioned in my note, and I think I must have been mistaken."

IOWA BIRDS.—The following species, not catalogued in J. A. Allen's excellent "Notes on Iowa Birds" (Mem. Bost. Soc. Nat. Hist., Vol. 1., Pt. iv.), have been collected by me in Iowa, and are mostly preserved in the cabinet of Iowa College, Grinnell. When no locality is given, the central adjoining counties of Poweshiek and Jasper are to be understood. In two cases of doubt, an interrogation point is added. The word "summer" for summer resident, is used when justified by recorded dates of capture.

*Turdidae*:—Hermit Thrush (*T. Pallasii* Cab.); seen but twice. Olive-backed Thrush (*T. Swainsonii* Cab.); common in a locust nursery last year; wholly absent this year. Ruby-crowned Wren (*R. callendula* Licht.); seen as late as May 2d. *Troglodytidae*:—Short-billed Marsh Wren (*C. stellaris* Cab.); summer. *Sylvi-colidae*:—Black and White Creeper (*M. varia* Vieill.). Yellow-rumped Warbler (*Dendroica coronata* Gray); common. Chestnut-sided Warbler (*D. Pensylvanica* Baird); summer. Nashville Warbler (*H. ruficapilla* Baird); summer. *Hirundinidae*:—Rough-winged Swallow (*C. serripennis* Bon.); summer. *Liotrichidae*:—Mocking Bird (*M. polyglottus* Boie); June 25th, August 4th, and October 21st; in both the central counties mentioned; but no song heard. *Vireonidae*:—White-eyed Vireo (*V. noveboracensis* Bon.); June 1st. Yellow-throated Flycatcher (*V. flavifrons* Vieill.); summer. Red-eyed Flycatcher (*V. olivaceus* Vieill.); summer. *Fringillidae*:—Harris's Finch (*Z. querula* Gamb.); taken twice, the latest May 19th. Black Snow-bird (*J. hyemalis* Scat.); abundant in early spring. Snow-bunting (*P. nivalis* Meyer); Clinton county, and, I think, Poweshiek. Purple Finch (*C. purpureus* Gray); Clinton county. Red Crossbill (*C. Americana*

Wils.); Lee county. White-throated Sparrow (*Z. albicollis* Bon.); October 7th. Tree Sparrow (*S. monticola* Baird); common in March and April. Swamp Sparrow (*M. palustris* Baird); taken in October. Indigo Bird (*C. cyanea* Baird); summer; very common. Cardinal Bird (*C. Virginianus* Bon.); Lee county. *Icteridae*:—Rusty Blackbird (*S. ferrugineus* Sw.); Clinton and Poweshieck counties. *Tyrannidae*:—Yellow-bellied Flycatcher (*E. flaviventris* Baird); summer; not rare. *Cuculidae*:—Yellow-billed Cuckoo (*C. Americanus* Bon.); summer; only taken in a grove in Kellogg, Jasper county. *Picidae*:—Pileated Woodpecker (*H. pileatus* Baird); Lee county. *Strigidae*:—Short-eared Owl (*B. Cassini* Brewer). *Falconidae*:—Duck Hawk (*F. anatum* Bon.); Clinton county. Sharp-shinned Hawk (*A. fuscus* Bon.); Clinton county. Golden Eagle (*A. Canadensis* Cass.). Bald Eagle (*H. leucocephalus* Savig.). *Columbidae*:—Passenger Pigeon (*E. migratoria* Sw.); few seen; one taken young, June 26th. Gray or Red-breasted Snipe (*M. griseus* Leach); Clinton county. Tell-tale or Stone Snipe (*G. melanoleuca* Bon.); Clinton county. Yellow-legs (*G. flavipes* Bon.); common in prairie sloughs. Solitary Sandpiper (*R. solitarius* Bon.). Marbled Godwit (*L. fedoa* Ord.). *Gruidae*:—White or Whooping Crane (*G. Americanus* Ord.); Tama county. *Rallidae*:—Sora, or Common Rail (*P. Carolina* Vieill.). Coot (*F. Americana* Gm.). *Anatidae*:—Trumpeter Swan? (*C. buccinator* Rich.); young. Brant (*B. brenta* Steph.); large flocks, doubtless this species. Spoonbill (*S. clypeata* Boie); Clinton county. Gadwall (*C. streperus* Gray); Polk and Clinton counties. Ringnecked Duck (*F. collaris* Baird); young. Redbreasted Merganser (*M. serrator* Linn.); Lee county. Hooded Merganser (*L. cucullatus* Reich.); Lee county. Snow Goose (*A. hyperboreus* Pallas); Lee county. *Pelicanidae*:—Rough-billed Pelican (*P. erythrorhynchus* Gm.); Lee county. *Laridae*:—Ring-billed Gull (*L. Delawarensis* Ord.). Forster's Tern? (*S. Forsteri* Nutt.); Clinton county. To this list I may add the Prothonotary Warbler and the Magpie (a straggler), known to have been taken in Lee county. All of the above from Lee and Clinton counties were not taken by myself, but I have no reason to doubt the correctness of the locality given. I thus add fifty-four species to one hundred and eight of Mr. Allen's list, which were observed in seven counties of Western Iowa.

Mr. Allen speaks of the scarcity of certain birds. Of these, the Robin, Blue Bird, Chipping Sparrow, Cat Bird, Yellow War-

bler, Warbling Vireo, Loggerhead Shrike, Bobolink and Great Horned Owl, are abundant in the district now especially reported from. I have not met with Wilson's Thrush, Winter Wren, Titlark, Tennessee and Blue Warblers, Grass Finch, Henslow's Sparrow, Arkansas and Great-crested Flycatchers, Yellow-bellied Woodpecker, Least, Pectoral and Spotted Sandpipers and Sooty Tern. — H. W. PARKER.

THE COLORADO POTATO BEETLE IN NILES, MICHIGAN. — While in Niles, Michigan, this winter, I took somewhat special pains to gain information in regard to the Colorado Potato Beetle, as it had been observed on one farm in that town. On the farm of James Hudson, of whom I made my inquiries, not a bug of this sort was seen before or during the year 1868; but a very few were seen on a farm about half a mile to the west. In the summer of 1869, this beetle appeared on Mr. Hudson's potatoes, when they were about a foot high; when he first saw them only two or three were on a hill, but they increased all through the season.

In April, of 1870, Mr. Hudson in plowing his fields, ploughed up the full grown beetles, and they walked about, being very lively. He planted Early Rose potatoes about April first, and as soon as they were fairly up these beetles commenced their attacks upon them. He began to kill them by squeezing them between two paddles, going over the ground daily, but apparently without checking them. He then mixed Paris Green with ashes and sprinkled the mixture on a dozen rows, the vines at this time being a foot high, and from these rows he secured a fair crop of potatoes. Where the mixture was not sprinkled, the bugs ate all the leaves, and in many cases they ate the stalks to a considerable extent. They now began on a new field hitherto untouched, appearing in such numbers as almost literally to cover both the leaves and the stalks. They were so numerous that in less than an hour one man gathered about twenty quarts of them! They readily drop from the vines and then feign death. The beetles swept right through this field, going at the rate of about ten or twenty rods in a week. Their yellowish eggs were always abundant on the under side of the potato leaves; but they also laid their eggs on weeds, spires of grass, and *even on dry sticks!* While the havoc, above described, was going on, no other species of insects attacked the potatoes. At this time the Colorado bugs were abundant

about the farm-buildings, and even entered the house. Toads are their natural enemies, eagerly devouring them. But on this farm the hens were never seen eating them.

On the farm above mentioned, the bugs disappeared suddenly in the early part of September.

It may be added that they seem to prefer Chenango potatoes to the Early Rose; and that they would hardly touch the Early Goodrich, though growing side by side with the Chenango, which they eagerly devoured. I would also add that these insects do not confine themselves to the vines, but enter the hills and attack the potatoes themselves. — SANBORN TENNEY, *Williams College, February, 1871.*

DESTRUCTIVENESS OF THE WHITE ANTS.\* — Having to repair and paint my office a year ago, my boy put my stationery for a few days on the floor, when, to my surprise, I found it all eaten through by the white ants, which are destructive of everything upon this Island. Nothing but teak, and not always that, escapes their fangs. Numbers of houses in Jamestown are fairly gutted by them — doors, window sashes, floors and roofs are all eaten up — so that nothing but the bare walls are now standing, their owners being too poor to rebuild with iron and teak.

I send a volume of Allison's History of Europe, to show you the destructive powers of this extraordinary insect. — THOMAS FETNAM, *United States Consul at St. Helena.*

SINGING MICE. — A communication in the NATURALIST some time ago in regard to musical mice, prepared me for a phenomenon which recently came under my observation, which otherwise would have astonished me beyond conception. I was sitting a few evenings since, not far from a half-open closet door, when I was startled by a sound issuing from the closet, of such marvellous beauty that I at once asked my wife how Bobbie Burns (our canary) had found his way into the closet, and what could start him to singing such a queer and sweet song in the dark. I procured a light and found it to be a *mouse*! He had filled an over-shoe from a basket of pop-corn which had been popped and placed in the closet in the morning. Whether this rare collection of food inspired him with song I know not, but I had not the heart to disturb his corn,

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\* Communicated by the Smithsonian Institution.

hoping to hear from him again. Last night his song was renewed. I approached with a subdued light and with great caution, and had the pleasure of seeing him sitting among his corn and singing his beautiful solo. I observed him without interruption for ten minutes, not over four feet from him. His song was not a *chirp*, but a continuous song of musical tone, a kind of *to-wit-to-wee-woo-woo-wee-woo*, quite varied in pitch. While observing him I took for granted that he was the common house-mouse (*Mus musculus*), but when he sprang from the shoe to make his escape he appeared like the prairie mouse (*Hesperomys Michiganensis*), a species I had not, however, observed before indoors. I have thus far failed to secure this little rodent musician, but shall continue to do all I can in the way of pop-corn to entertain him, and if his marvellous voice gives him the preëminence in mousedom which he deserves, by the aid of Natural Selection I shall presently have a chorus of mice, in which case you shall receive their first visit. — W. O. HISKEY, *Minneapolis, Minn.*

THE EUROPEAN HORNET IN AMERICA. — This wasp (*Vespa crabro* Linn.) is very common here, and has been to my knowledge for the past twenty-five years, or ever since I have been in this place. I think it is something over twenty years since there was an immense colony in the roof of an old ice house, at the gable end of which was a round hole for air about four or five inches in diameter. This hole formed the entrance to their abode. Both their brood cells and the outer covering are very brittle, so much so, that it is impossible to preserve them whole. The paper seems to be made of green wood, in procuring which, they girdle great quantities of the branches of our lilac bushes.

The mass of comb which I send you, was taken, I think, two years ago last fall. The following are the dimensions of the comb, independent of the outer covering, at the time I secured it: — Eighteen inches long, twenty-three inches in circumference. There were eleven stories or sets of comb. The circumference of each, commencing at the top, was as follows: — 17, 23, 27, 27, 27, 28, 28, 27, 23, 19, 7, inches, making a united circumference of about twenty-one feet. Width of largest cells four lines, making six and a quarter cells to the square inch. This, I believe, makes about one thousand five hundred and eighty-one cells. This nest was between the weather boards and the inner lining of boards, in what

was once an ice house. This cavity was at one time filled with hay, but the hay in many places had settled down, leaving large vacant spaces, in one of which this nest was formed, about four or five feet from the ground. The entrance was by a knot hole.—J. ANGUS, *West Farms, N. Y.*

[Mr. A. J. Olmstead writes us that this hornet has been seen since 1863, at Morristown, N. J., and that the nest is made of the green wood of the lilac. "It does much damage to fruit, but at the same time destroys many insects."—Eds.]

THE MIGRATION OF HAWKS. — The solitary habits of the Hawks are so frequently referred to in general works, treating of the natural history of these interesting birds, as being especially distinctive of the birds of this family, as to fully indicate the general prevalency of the opinion that they are in no degree gregarious, in confirmation of the observations of Dr. William Wood, published in the February number of the *NATURALIST* (1871), in which he states he and some of his ornithological friends had repeatedly noticed considerable companies of hawks passing over in early spring-time. I may add that I have myself observed numerous similar instances, in the autumn as well as in the spring. At Springfield (Massachusetts), I for several years noticed it as a quite regular occurrence, and I have since observed similar flights of hawks in Iowa. On one occasion (in April, 1862) I noticed hundreds slowly sailing over in the peculiar gyratory manner of these birds. They formed a long loose flock, extending both to the northward and the southward as far as could be seen, the whole company occupying more than an hour in passing a given point. Though soaring at a considerable height, it was easy to see that the company was composed of representatives of several species. While this mode of migration is more characteristic, perhaps, of our *Buteones* (the Red-tailed, Red-shouldered, and Broad-winged Hawks) than of other species, the common *Accipiter Cooperi* is frequently associated with them.—J. A. ALLEN.

LONGEVITY OF A MARINE SHELL. — Mr. Tryon (Conch. Sec. Acad. Nat. Sci., Philad.) read a letter from Mr. W. M. Gabb, who collected *Littorina muricata* in the first week in September, specimens of which were now living, although having been out of water not less than four months. This he believed was the first case, on record, of the longevity of life illustrated in marine species.

THE WING OF BATS.—In Max Schultze's "Archiv," Band vii., 1<sup>tes</sup> Heft, is a most exhaustive and interesting paper on the structure of the bat's wing, by Dr. Joseph Schöbl, of Prague. Long ago Spallanzani discovered that bats which had their eyes put out were able, nevertheless, when allowed to fly about in a room, to avoid threads stretched across it. This faculty he attributed to some highly developed sense of touch possessed by the wing. Dr. Schöbl has repeated these experiments; but for the putting out of the eyes he has substituted the less painful method of covering them with sticking plaster. He has kept bats, thus treated, for a year alive in his room, and has entirely confirmed Spallanzani's results. To account for these phenomena, the wings of bats have been examined for peculiar nerve-endings, by Cuvier, Leydig, and Krause, but without any success. The author's discoveries are therefore quite new to science. The following is a short abstract of his results. The bat's wing membrane consists of two sheets of skin, the upper derived from that of the back, the lower from that of the belly. The epidermic and Malpighian layers in each sheet remain separate, whilst the true skin is inseparably fused. In this fused medium layer are imbedded the muscles, nerves, vessels, etc., of the wing. A complicated arrangement of delicate muscles is described, which have their tendons formed of elastic tissue instead of the usual white fibrous tissue. There are also present numerous long elastic bundles stretched in different directions in different regions of the wing. The arteries are each accompanied by a single vein and a nerve, the three keeping company as far as the commencement of the capillary system. With regard to the pulsation in the wing, Dr. Schöbl has nothing new to add to the observations of Wharton Jones and Leydig. The whole wing is covered, both on the upper and under surface, with extremely fine, sparsely scattered hairs. These hairs are most numerous on the inner third of the hinder part of the wing, and they gradually decrease in number towards the tip. The two wings, taken together, contain from eight thousand to ten thousand of them. They have a general resemblance to those on the body, but are simpler in form. Their length is about  $0.2500^{\text{mm}}$ . in *Vesperugo serotinus*, the species principally made use of in these investigations. Each hair sac has from two to seven sebaceous glands, according to the species, and one sweat gland opening into its sac. The two outer fibrous layers of the hair sac have no sharp line of demarcation

to separate them from the surrounding connective tissue, but the inner or hyaline coat is highly developed, and, after being constructed beneath the hair bulb, widens out and encloses the sense-bodies (Tastkörperchen), one of which organs is connected with each hair.

The nerves of the wing may be considered to consist of five layers, *i. e.*, there is one occupying the centre of a transverse section of the wing, which gives off on each side of it four others, and these are successively finer and finer as they approach the opposite surfaces. The inner layer and the one immediately on each side of it, consist of nerve fibres with dark borders, the other layers of pale fibres only. The tastkörperchen are connected with the second layer. The fifth layer of finest fibres ends as a network between the innermost layer of cells of the Malpighian layer of the epidermis. The tastkörperchen are shaped like a fir-cone with a rounded apex turned inwards. They lie immediately below the root of the hair; and their core or central substance is formed of a prolongation of the cells forming the two root sheaths of the hair. Their length is 0.0259 and their breadth 0.0175<sup>mm</sup>. A nerve containing about six dark-edged fibres is distributed to each körperchen. Just before the nerve reaches this organ it splits into two, and three fibres pass to one side of it, three to the other. The fibres are then wound round the body so as to sheathe its cellular core. Dr. Schöbl thinks it probable that the fibres on one side are continuous with those on the opposite side, and that there is thus a bipolar arrangement here. He attributes to the fine network of pale nerve fibres belonging to the fifth layer the appreciation of temperature, pain, etc.; to the tastkörperchen the highly exalted sense of touch. It is curious that both kinds of nerve endings are connected with the Malpighian layer of the skin. In conclusion, the author states that he believes he has found similar bodies in peculiarly sensitive places in other mammals, and promises an early account of them. —*The Academy*.

DIFFERENCES BETWEEN YOUNG AND ADULT FISHES.—MR. R. Bliss, at a meeting of Bost. Nat. Hist. Soc., spoke of some of the markings which distinguish young from adult fishes. He had recently examined some specimens from India which had a double line on the median space; or rather a single line starting from the gill-

covers, running to the tail and then returning to the gill-covers. He found this to be the young state, and this the manner in which a dark, solid band was formed and became perfect when the fish reached the adult state. Another species forms a band which disappears, leaving only one spot at the head and another at the tail. A third species begins with a band and ends with cross striae, the band disappearing. These examples, he said, show the necessity of studying fishes in all stages of their growth.

CARDINAL GROSBEEK.—On the 31st of January last, a day to be remembered as one of the coldest of this very cold winter, a specimen of the female Cardinal Grosbeak (*Cardinalis Virginianus* Bonap.) was shot in the spruce woods at Point Pleasant, about one mile from Halifax. The plumage of the bird forbade the idea of its having escaped from confinement, while its shyness, coupled with the fact of its being found on skinning to be actually fat and in good condition, precluded the possibility of its being a storm-blown waif, brought by a revolving gale from the south. Its crop contained a few partially digested seeds, cereal in appearance.—J. MATTHEW JONES, *Halifax, Nova Scotia*.

ARRIVAL OF BIRDS.—On March 9th the first Bluebirds and Robins made their appearance in Salem, and on March 10th two flocks of geese passed over the city on their northern journey. The White-bellied Swallow was not noticed before April 2d.

THE CHITONS.—Dr. P. P. Carpenter, of Montreal, made a verbal communication to the Boston Society on the family of Chitons; but, as his Monograph of the group is now in the press, and will shortly be published by the Smithsonian Institution, it is not necessary to anticipate his results. If any naturalists have species which they wish reported on, he will be happy to name them from the typical series, which (with his other collections) he has presented to the Museum of McGill College.

CATTLE TICK IN THE HUMAN EAR.—Enclosed you will find a tick the history of which is this:—A young man applied to Dr. Boucher, of Iowa City, for a trouble of the ear. Four months before he had been in New Mexico and had slept out of doors many times. The trouble of the ear commenced about that time. His ear pained him many times but not severely. On looking into his ear foreign material was seen, and on removal proved to be the

bug enclosed. It was alive and lived three days thereafter.—E. H. HAZEN, M. D., *Davenport, Iowa.*

[It is a species allied to *Ixodes boris* Riley, or common cattle tick.—Eds.]

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—The Board of Trade of Indianapolis recently held a meeting for the purpose of making arrangements for the next meeting of the A. A. A. S., which will be held at Indianapolis in August next, beginning on Wednesday, the 16th. The meeting was largely attended and a Local Committee of one hundred persons was appointed and divided into sub-committees on *Reception, Finance, Lodging, Excursions, Rooms, Invitations, and Railroads.* Arrangements were made for two excursions during the session of the Association. One to Terre Haute, a distance of seventy-three miles from Indianapolis, where the Association will remain over night and partake of the hospitality of the citizens. On this excursion a visit will be made to the celebrated Block-coal field (iron smelting coal) and Blast furnaces, of Clay County. This coal is now attracting much attention and the visit will be most interesting geologically. The other excursion proposed is to New Albany, on the Ohio River, where there are a number of interesting manufactures, among them the only plate glass works in the United States. One of the largest railroad bridges in the world is also located there. The Association will also remain at New Albany over night.

The people of Indianapolis and vicinity seem to be resolved to make the forthcoming meeting a success, and every facility and accommodation will be secured to the members of the Association.

The following are the officers of the Local Committee:—*Chairman*, HON. DANIEL MACAULEY; *Vice Presidents*, THOMAS MCGUIRE, Esq., and JOHN C. WRIGHT, Esq.; *General Secretary*, T. B. ELLIOTT, Esq.; *Corresponding Secretary*, Professor E. T. COX; *Treasurer*, F. A. W. DAVIS, Esq.

The following are the officers of the Association for the Indianapolis meeting:—*Retiring President*, Dr. T. STERRY HUNT, Montreal; *President*, Professor ASA GRAY, Cambridge; *Vice President*, Professor G. F. BARKER, New Haven; *Permanent Secretary*, Professor JOSEPH LOVERING, Cambridge; *General Secretary*, F. W. PUTNAM, Salem; *Treasurer*, W. S. VAUX, Philadelphia.

We understand that the sub-section of *Microscopy*, so well started at the Salem meeting, and developed at Troy, will be well represented at the next meeting, and we beg to suggest to the Local Committee the importance of providing a room with proper light and substantial tables for the use of this sub-section, and a safe place for the deposit of the instruments that undoubtedly will be taken to the meeting if members are notified in the general circular that such arrangements have been made.

We also trust that some change will be made by the Association in relation to the Proceedings on the first day, and the time of delivery of the President's address, which certainly should come off before he resigns the chair to his successor, and there seems no more appropriate time for the delivery of the address than the first evening, which it would be well to have permanently allotted to this purpose by vote of the Association. The organization of the meetings of the Association could be very much facilitated by a complete change of the present irregular and confusing mode of proceeding, and we trust the next meeting will inaugurate a decided change in this respect.

Members will remember that the titles of their papers must be sent in advance to the *Permanent* Secretary.

In this connection we call attention to a circular, which has been mailed to the address of every member from the office of the *NATURALIST*, in relation to the early publication of the papers to be read at the meeting, and to request any person, who has not received a copy and who intends to read a paper in any of the Natural History Sections, to send to the office of the *AMERICAN NATURALIST* for one.

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## GEOLOGY.

SOME PHYSICAL FEATURES OF THE APPALACHIAN SYSTEM AND THE ATLANTIC COAST OF THE UNITED STATES, ESPECIALLY NEAR CAPE HATTERAS. — At the meeting, February 1st., of the Boston Society of Natural History, Professor N. S. Shaler gave an account of the coast line in the neighborhood of Cape Hatteras and the Chesapeake Bay. He thought it important in view of the Zoological as well as the physical history of the continent, to determine the causes which had given the existing form to the shore line of this continent. The coast between the Rio Grande and the Chesapeake, presents but two considerable prominences. The first,

that of Florida, is probably entirely the product of organic life, and as such, probably the most considerable geographical feature on our earth's surface the product of that agent alone. Cape Hatteras, however, cannot be regarded as in any way the result of reef building animals, though it has been suggested that possibly the banks so like the reefs of Florida, may rest upon ancient coral deposits. Sections through the reefs show that they are built on clay bottoms. The Delaware and Chesapeake bays may be, in part, at least, accounted for by supposing that the vast ice streams which during the glacial period passed down the main rivers which lead into them, just as they poured down the Hudson and the Connecticut, had eroded the soft rocks upon which they descended from the harder rocks of the Appalachian Mountains just as the streams of the Rhone and Rhine had cut away the soft rocks making the lake basins of Geneva and Constance. We cannot, however, in this way account for the formation of Pamlico and Albemarle sounds, though the mud and sands which form the outlying banks are probably derived from the excavation of the Chesapeake, just as the similar deposits, which enclose the broad water of the peninsula of Eastern Virginia, are derived from the excavation of the Delaware Bay.

It is likely that the promontory of Cape Hatteras is the result of the elevation of an outlying ridge of the Appalachians near Richmond, Virginia. At that point there is a ridge of syenite appearing from beneath the tertiary clays. This ridge clefs to the east; beneath the clays to the north, is similarly hidden, but, towards the south, extends as far as near Weldon, where it may give place to other similar ridges which continue the elevation to the southward. The height of this ridge can be ascertained by following it to the westward, where we find it sinking beneath the coal, the syenite lying more than a thousand feet deep, at a distance of ten miles from the summit. So we see that Richmond is on a mountain one thousand feet or more high, though covered by subsequent accumulations after having been much eroded. The mining sections through the beds of the Liassic coal field give us the best of evidence on this point. This ridge is parallel to the Alleghanies, and must be regarded as part of that system. We must modify our theory of the elevation of the Appalachian chain, so as to admit that, instead of having been altogether the product of forces acting during and just after the carboniferous time

alone, this elevation continued to go on until after the formation of the Liassic rocks of the Richmond coal field which are much disturbed by the elevation of the syenite ridge to the eastward. While the Appalachians have this comparatively recent outline to the eastward, they have an ancient ridge in a comparable position about as far to the westward. The Cincinnati and Nashville Silurian domes are only the highest points of a low ridge which was elevated on a position parallel to the subsequently created Appalachian system. This ridge was elevated as early as the period of the Calciferous sand rock. This is proven by the traces of beaches and broken shells in beds of the Hudson River Period, and by the existence of great deposits of salt in the Calciferous sand rock which could only have been formed when that rock was out of water. We have, in this ridge, the first of the folds of the Appalachian system, which built continually towards the eastward.

The Hatteras projection was due to the elevation of the Richmond element of the Appalachians. The border tertiary rocks were thrown up and have resisted the wearing action about Hatteras. This ridge was possibly of the same age as the Connecticut River dislocations of the Tom and Holyoke series, and of the Martha's Vineyard series, to which it is approximately parallel.

The history of the Appalachian chain showed that they, like most mountains, tended to grow by successive parallel additions. Mountains are characteristically shore phenomena, rarely being developed away from that line.

The character of the topography changes materially south of Weldon. Its character cannot be explained by the ordinary atmospheric influences. The soundings also afford similar indications. The topography near the coast is purely submarine, as formed by the action of the sea. Passing inland, the evidences of the action of the atmospheric agents appear. He thought the whole of this shore indicated a recent origin, an emergence and a slight sinking within the period of man's remembrance. There had been in the most recent geological period a rising and sinking of the coast, as at Charleston, of fifty or sixty feet; Maine, two hundred feet; and greater on the coast of Labrador, as Dr. Packard has shown. These alternations of sinking and elevation could be accounted for by supposing that the sea flows in their central regions, more constantly sinking the land areas, rising

when the pivot point of this rotation was at the shore, the sinking of sea bottom and rising of the land could go on without changing the position of the shore line; if, however, this pivot point were to the seaward of the shore, the movement would cause the land to gain on the sea; if the pivot point were to the landward of the shore, the sea would seem to gain.

He spoke of the great influence which Hatteras had exerted in deflecting the Gulf Stream from its course.

Dr. C. T. Jackson said that the syenite at Richmond, Virginia, must have been elevated in a cold state; there was no evidence of its having interpenetrated the coal measures. He agreed with Professor Shaler in regard to the elevation of the coast, the pivot point being in Virginia. In Carolina a cannon placed in one of the streets is now under water. In the eastern parts of the State of Maine fishermen had noticed what they call the growth of rocks; those which, within their recollection, were submarine, now appearing above the surface.

Mr. Shaler referred to Mr. Heinrichs, who was now working in the coal measures at Richmond, and hoping soon to get down to the syenite. He expected valuable results from the investigations.

Mr. J. B. Perry said, in regard to the syenite underlying the coal, that there was no evidence of intrusion. The syenite was in existence before the coal was laid down. In regard to the formation of the coast, he alluded to the observations of Elie de Beaumont, that the elevations of a particular period were parallel. The oldest uplifting, that on the west of Hudson's Bay in N. N. W. and S. S. E. direction, called in Europe the elevation of Finisterre, is earlier than the Laurentian, and crosses it. Suppose there were such an elevation under the surface of the water, corals would form upon that ridge, and an easy explanation is afforded of the extension of Florida in this direction. Supposing parallel elevations, another might have had a bearing upon Hatteras. He was satisfied that Martha's Vineyard was elevated at the close of the Pliocene period. Mount Etna was elevated at the same time.

The earlier elevations of the Alleghanies occurred during the Longmynd period, at the end of the Silurian period. The axis of Cincinnati was the beginning of this uplifting.

He had studied the coal measures in the neighborhood of Richmond, and differed from the general conclusions in regard to them. Some of the fish from Virginia, New Jersey, and the Connecticut

valley, are identical, and have a character intermediate between those of the Permian and the Jurassic. The same formation extends from South Carolina to Nova Scotia. The character of the fossiliferous portion of the Connecticut valley shows it clearly to be Triassic. The Permian was a cold period. The Triassic, a warm period, followed. He thought it was neither Permian nor Jurassic, as many supposed, but Triassic.

Mr. W. H. Niles said the question which Professor Shaler had brought forward was one of great interest. He objected to the view taken by Mr. Perry of the formation of Florida and Hatteras. Professor Shaler's view, he said, was consistent with all the physical features of our Eastern coast. The deepest portion of the sea bed lies opposite the highest mountains, showing a parallelism between the Atlantic valley and the Appalachian system. The Cincinnati axis, he said, was instructive because showing that all parallel chains were not raised at the same time. The long terrace of the Atlantic plain forms another parallel. The streams also conform. The depositions are parallel with the mountain chains. He accepted Professor Shaler's explanation of the elevation and depression of land in connection with water deposition.

Mr. Perry remarked that when one line of upheaval crosses another, it will be modified; and a very old one will be largely disguised, yet may have had its effects and been a condition, as in Florida, affording ground for the corals to work.

Mr. Hyatt remarked, that besides the general westerly and easterly motion described by Professor Shaler, there were evidences of a motion transverse to this along the coasts. Thus the north of Greenland, as shown by various arctic explorations, has beaches recently elevated; and historical records, as well as direct observations, have proved that the south of Greenland is sinking. Dr. Packard's observations in Labrador give the evidence of a comparatively recent elevation, probably still going on. Farther south, at the Mingan Islands, the speaker had observed a series of beaches, the lowest of which remained near high-tide mark. On the Island of Anticosti the remains of fresh-water shells were found, which had apparently died from the influx of tide-water into the little estuary, or mouth of a brook, where the water had formerly been fresh. There were two cliffs stretching around the southern shore of this island, each about fifty feet high. The present sea level, however, at high tide, now reached the foot of the inner cliff, over-

flowing the outer cliff to the depth of two or three feet or more, in different localities. The shores of Nova Scotia, according to the observations of Professor Marsh and others, were, if the speaker remembered rightly, sinking. The shores of Maine, as shown by Dr. C. T. Jackson, Dr. Packard and others, were rising. At Marblehead Neck he had observed a water-worn cliff elevated eight or ten feet above high-water mark, and protected by a ridge of shingle, which forms the back of the present beach. This beach now intervenes between the cliff and the water's edge, which is between thirty and forty feet distant.

Observations made by the Coast Survey show that the coast in Long Island Sound and southward in New Jersey has been sinking. The formation of Florida Keys shows that that state is rising. These and other facts which proper investigation would undoubtedly bring to light, indicate a series, or perhaps many series, of transverse waves of elevation and subsidence running down the coast at right angles to the direction of the great waves which elevated the Appalachians.

Mr. Niles showed that from the earliest times, in the Adirondacks, and at different points southerly, there had been peninsulas corresponding in position with Florida, which was the most southern and latest.

NATURAL HISTORY OF DEEP-SEA SOUNDINGS BETWEEN GALLE AND JAVA, BY CAPTAIN CHIMMO.—The ooze dredged up from a depth of two thousand three hundred fathoms, where the temperature was found to be 35° F., consisted to the extent of ninety per cent. of organic matter, Foraminifera, chiefly Globigerinæ, together with Polycistinæ, with a few broken sponge-spicules. In the shallow water near Sumatra, the animal life has decreased to only about five per cent. of the ooze, the Globigerinæ having entirely disappeared. The water brought up from great depths was found to contain a large proportion of salts in solution, which crystallized out immediately on exposure to the air. Mr. Busk remarked on the great interest and importance of the observation of the low temperature of the deep water in a latitude within a few degrees of the equator, strongly confirming the conclusions as to a general circulation of the water between the equator and the poles drawn from similar observations in the Atlantic.—*Nature*.

DISAPPEARANCE OF AURORA ISLAND. — Referring to the statement of the disappearance of Aurora Island (one of the New Hebrides group), recently printed in the newspapers, Mr. Tryon exhibited to the Conchological Section of the Academy of Natural Sciences of Philadelphia, at their meeting January 5th, 1871, two species of shells from the collection, supposed to be peculiar to this island, remarking that in the event of the reported submergence of the island being confirmed, these must be classed among the lost species. In his report on the mollusca collected by Wilkes's U. S. Exploring Expedition, Dr. Gould gives the following account of Aurora Island:—

“ The little island of Metia, or Aurora Island, to the northeastward of Tahiti, is one of peculiar interest. It is a coral island which has been elevated two hundred and fifty feet or more, and has no other high island near it. On it were found four small land shells belonging to three genera, viz.:—*Helix pertenuis*, *Helix Dædalea*, *Partula pusilla* and *Helicina trochlea*. None of these were found upon any other island. They seem to have originated there, after the elevation of the island, and have a significant bearing upon the question of local and periodical creations in comparatively modern times.”

GEOGRAPHY OF THE SEA BED. — At the meeting of the Royal Geographical Society, held on Nov. 29, a paper was read “ On the Geography of the Sea Bed,” by Capt. Sherard Osborn, R. N. The author gave an account of our present knowledge of the configuration of the bed of the ocean, as derived from Admiralty surveys and submarine telegraph expeditions during the last fifteen years. His explanations were illustrated by a number of diagrams showing sections of the North Atlantic and other oceans. It has been definitely ascertained that the greatest depth of the ocean does not reach 3,000 fathoms in any part where telegraphic lines have been laid. The bed of the North Atlantic consists of two valleys, the eastern extending from 10° to 30°, the western from 30° to 50° West Longitude. The extreme depth of the eastern valley is under 13,000 feet, which is less than the altitude of Monte Rosa. This valley has been traced southward to the equator. It is separated from the western valley by a ridge in 30° West Longitude, in which the average depth is only 1,600 fathoms. This ridge terminates to the north in Iceland, and southward at the Azores, so that it is volcanic in its character at both extremities. Its extreme breadth appears to be under 300 miles, and the Atlantic deepens from it on

both sides. Explorations carried on in the Mediterranean, the Red Sea, and the Indian Ocean, showed similar uniformity in the level of the sea bottom; and the general conclusions arrived at by Capt. Osborn were, that in the deep sea there is an absence of bare rock, and that there are no rough ridges, cañons or abrupt chasms; moreover, that the bed of the deep sea is not affected by currents or streams, even by those of such magnitude as the Gulf Stream; but that it rather resembles the prairies or pampas of the American continent, and is everywhere covered with a sort of ooze or mud, the *débris* of the lower forms of organic life.

COLOSSAL FOSSIL SEA-WEED.—From the microscopic examination of the structure of specimens of the fossil trunks described under the name of *Prototaxites Loganii*, and which Principal Dawson affirmed in his Bakerian lecture before the Royal Society, to be the oldest known instance of Coniferous wood, Mr. Carruthers has discovered that they are really the stems of huge Algae, belonging to at least more than one genus. They are very gigantic when contrasted with the ordinary Algae of our existing seas, nevertheless some approach to them in size is made in the huge and tree-like *Lessonias* which Dr. Hooker found in the Antarctic seas, and which have stems about twenty feet high, and with a diameter so great that they have been collected by mariners in these regions for fuel, under the belief that they were drift-wood. They are as thick as a man's thigh.—*The Academy*.

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#### MICROSCOPY.

IMPROVEMENTS IN THE LENSES OF MICROSCOPES.—For some time, people in England have been content to let the improvement of the optical powers of the microscope remain entirely in the hands of the makers, believing, apparently, that Mr. Lister had effected all in his suggestions and improvements that could be desired. Dr. Royston Pigott, an able mathematician, formerly fellow of St. Peter's College, Cambridge, and a Doctor of Medicine of that University, was not, however, inclined to look at the matter in this way, and for many years has been working and experimenting with a view, first, to test the accuracy of our best object-glasses, and, secondly, to suggest means for their improvement. It should be remembered that Oberhauser, Nachet, and especially Hart-

nack, on the continent, not satisfied with the old system of combinations for object-glasses, and not having the benefit of Lister's researches, have made excellent objectives on a totally different system, and during the last few years the last-named maker has carried his system of "immersion lenses" to such a point of excellence as really to surpass the best glasses on Lister's system, in definition, penetration, working distance, and illumination. Those who do not admit the excellence of these objectives, which are now used by nearly all German histologists, have probably seen older glasses, made at a time when Hartnack had not reached his best. It is worth stating, now that the Parisian opticians are inaccessible, that Gundlach of Berlin has succeeded in making excellent glasses of high power at astonishingly small prices, some of his 1-12ths and 1-16ths, immersion 1-16ths (so called), being admirable in their performance. They are not, however, equal to Hartnack's glasses, which, though costing far less than what similar English glasses cost, yet are more expensive than Gundlach's. It is only fair to all parties concerned to state that the terms 1-8th, 1-12th, 1-16th, etc., as now applied to an object-glass, appear to have no definite meaning, but depend on the caprice of the maker, since the magnifying power of glasses, with the same fraction assigned to them, differs enormously.

To return to Dr. Royston Pigott. He found the usual means of testing an object-glass by trying if it gave some particular appearance with a "test-object," such as the Podura-scale, very unsatisfactory, since we have no certainty to begin with as to what is the true appearance of such an object. He therefore examined minute images of objects of which he knew the true form, such as a watch-face or thermometer-scale, forming these images by aid of mercurial globules and the condenser properly adjusted below the microscope-field. By this means he has found that object-glasses corrected so as to show dark, sharply marked spines (like!!!) on the Podura-scale—a favorite test-object with our microscope-makers—give false, blurred, and distorted appearances with his known images, and on making such corrections of the objective as to show the known images in their true form, he finds that the Podura-scale, examined with the corrected objective, is not really marked at all, as supposed, but is beset with a series of bead-markings, which by intersection, when improperly defined, give the curious appearance like notes of exclamation. This important discovery

of the falsity of our high powers (1-8th to 1-16th) has led Dr. Royston Pigott to pay more attention to the lower powers, and he finds that though you may not get so much actual amplification, you yet get a truer effect, and greater clearness of detail, by employing very carefully made low powers (1-2d to 1-5th), and increasing the magnifying power at the other end of the microscope, *i. e.*, the eye-piece. We have in this way seen the beaded structure of the scales of the Podura more satisfactorily than with very high objectives, even when corrected so far as they would admit, and we may say the same of some Diatom-valves, *e. g.*, *Pl. formosum*. It would be most important to know how far such a change of combination would be useful in histological work.

The general upshot of Dr. Royston Pigott's investigations appears to be that it is desirable to shift the burden, hitherto cast almost wholly upon the objective, to the other parts of the instrument. We should be content with an objective as high as a fifth, or even less. A very deep eye-piece is to be used; and to correct residuary aberrations of the objective, and at the same time amplify, Dr. Pigott has introduced an important adjustable combination *between the eye-piece and the object-glass*. There seems to be considerable reason for the step proposed by Dr. Royston Pigott. Just as great results were obtained in passing from the single lens or combination to the compound microscope of eye-piece and objective, so by adding distinct integral factors to these two, such as Dr. Pigott's "aplanatic searcher," we may obtain excellences quite impossible by any amount of attention bestowed on the objective alone, or only with difficulty reached by long labour, leading to very high price for high powers.

Dr. Pigott has, during the past year, published some account of his researches in the *Quarterly Journal of Microscopical Science*, and has communicated papers to the Royal Society, one of which is about to appear in the Philosophical Transactions.

Naturally, at first, the makers in London and the Microscopical Society were sorely tried by Dr. Pigott's exposure of the Podura-scale, but we hear, as one good result already obtained, that Messrs. Powell and Lealand have constructed a new 1-8th, both dry and immersion, with great care, which is declared to be the best glass yet made. It has been proposed to form a committee for the purpose of examining carefully as to penetration, definition, and angular aperture, the best glasses of our English makers,

the best American glasses, and the best of Hartnack's, Gundlach's and others; the glasses being mounted similarly, with private marks only for recognition, so as to prevent all possibility of prejudice on the part of the committee. Were this done, the result, whichever way it tended, would be eminently satisfactory. Of this the writer is sure, that many persons—even eminent microscopists—have made up their minds about the qualities of foreign objectives, without having seen any, or only very poor examples, and then when a really fair specimen of such a glass is placed before them, they exclaim with astonishment “Why this is the finest glass I have ever seen.” We shall be glad to receive suggestions or assistance, in carrying out the proposed comparison of objectives. Dr. Royston Pigott has expressed his willingness to aid in such an undertaking.—E. R. L., in *Nature*.

COMMITTEE FOR TESTING OBJECTIVES.—Dr. G. W. Royston Pigott proposes (*Monthly Microscopical Journal*, London, March, 1871) the appointment of a committee for the examination and comparison of objectives by different makers. Both dry and immersion lenses should be tested; and, to avoid prejudice, they should all be mounted in a uniform and simple style, marked in cipher, and identified as the work of known makers only after the final report of the committee. They should be tested in reference to the following properties:—Resolution, Penetration, Magnifying power, Spherical and Chromatic aberration, and Angular aperture. Dr. Pigott also judges that “deep” eye-pieces should be employed, and a very limited and unusual illumination, points which might be left to the judgment of the committee, who would probably prefer to use all kinds of eye-pieces and various methods of illumination, not forgetting, of course, the separate testing of the different parts of the same objective, by the methods lately introduced by Dr. Pigott. (The writer has excellent lenses by the best makers, in which not only are the different zones of angular aperture unequally corrected, probably a more or less unavoidable error, but also the correction is distinctly unequal [from imperfect centering?] at equal distances from the axis; a pencil, say, at  $40^\circ$  from the axis, being better corrected than one at the same distance on the other side of the axis.)

As this subject is largely an international one, though not of sufficient importance to call for the meeting of a committee repre-

senting the different countries chiefly interested, any movement, if made at all, in reference to it, should be a concerted movement in England, Germany, France, if practicable, and this country, the same lenses being sent for study from one country to the other. Microscopists might thus be informed, not as to which objectives are the "best," but as to which desirable qualities are possessed in an eminent degree by the lenses of the various makers.—R. H. W.

**EYESIGHT AND THE MICROSCOPE.**—In using the microscope I have found that the best system is that recommended by Dr. Carpenter, who has probably had as much experience in this matter as any person I know of. It is to alternate the use of the eyes, always keeping the unemployed eye open. But I feel confident that it is of no use to keep the unemployed eye open if it be made to stare at a dead-black surface. It is the exclusion of light from one eye, and the consequent unequal action of the visual organs, that is thus produced, that causes the mischief that we dread; and it matters not whether this unequal action be produced by covering the eye with the eyelid, or by excluding the light from it by other means,—the result is the same. In making observations with the microscope, all extraneous light should be excluded from the eyes. Hence the value of a properly arranged shade. Such a shade, however, should consist of more than a mere flat sheet of pasteboard covered with velvet. It should have a perpendicular portion, rising up in front of the face, and cutting off all light except that which comes through the microscope. And now, having provided a shield of this kind, which, by the way, is easily made of pasteboard blackened on the inside with dead-black varnish (made of alcohol, lamp-black, and a very little shellac), if we punch an inch hole at such a point that the unoccupied eye can see it in the same way that the other eye looks through the instrument, we will find that the fatigue experienced by that eye is vastly less than when it is exposed to the dead-black surface. A few trials will set at rest all questions on this head, and the change from light to darkness is easily made by simply slipping a piece of blackened paper or card over the hole.

With few exceptions, we use altogether too much light with the microscope. Where a full flood of light is passed through a

transparent object, the finer points are apt to be "drowned" out entirely; and it is only by modifying the amount of light by means of the diaphragm, that we are enabled to make out the more delicate details. Hence it will be found that the use of the bull's-eye condenser, for concentrating the light on the mirror, and consequently augmenting the *amount* of light passing through the object, is, in general, totally unnecessary. This arrangement of the illuminating apparatus is totally different in its effects from that of the achromatic condenser, and cannot be substituted for it, as some persons seem to think.

No man can have worked long with the microscope without being led to a very careful consideration of the relative value of the various sources of illumination at his command. Much thought, and considerable experience, have led me to the following conclusions on the subject:—

The first requisite in the light that we use is *whiteness*. Hence, daylight, the light of a white cloud, the artificial white cloud illuminated by daylight, the light from the old-fashioned argand lamp burning sperm oil, the modern student lamp burning kerosene oil, and its various modifications, and the argand gas-burner, are good—their excellence being about in the order here laid down. Common gas-light, candles, and kerosene lamps are inferior just about in the order we have named. White light is not nearly so fatiguing to the eyes as the reddish glare from a half-smothered combustion. Hence in all cases we must seek to have the most perfect combustion and highest possible temperature of flame in our sources of artificial light. It is true that this gives rise to great heat, but this difficulty is easily obviated by the use of a proper screen or shade, and none will be found better than the one previously described. Indeed, when working by artificial light, it will be found that the heat is one of the most efficient causes of injury to the eyes, and the screen that we have mentioned is, perhaps, quite as useful, from the fact that it cuts off heat, as from its excluding unnecessary light.

The second requisite is steadiness. Nothing is more trying to the eyes than a flickering light.

Another requisite is that the instrument should be so steady that the object shall be retained in view and in focus without change. Any tremor is injurious to the eyes, and especially is this the case when that tremor produces a continual change in the

relation of the object to the focus. This difficulty is met chiefly in the use of small, single lenses, that are held in the hand, and it may be safely said that a single hour's work, with a lens of this description held in the hand, or mounted on an unsteady stand, will cause more injury to the eyes than weeks of work where a first-class instrument of far higher power is used. It has always seemed to us that watch-makers, engravers, and those who use lenses, do not sufficiently appreciate this fact. They, in general, mount their lenses on wire stands, which tremblingly respond to every footstep that falls upon the floor, and thus cause continual demands upon the eye for re-adjustment of focus. So, too, we have seen students of botany poring over plants by the hour, and using a small hand-lens, which must have been utterly destructive to the eyes. Wherever a microscope—single or compound—is used for more than a few seconds, it ought to be mounted upon a stand so firm that all vibration, and especially all disturbance of the focussing, will be avoided.—*Good Health*.

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#### ANTHROPOLOGY.

PROBABLE IMPORTANT ARCHEOLOGICAL DISCOVERY.—In these days of archaeological humbugs we hardly venture to copy any account of a reported discovery, but feeling confident that Mr. Meehan would not have printed Mr. Douglas's letter unless he knew him to be a reliable observer, we give the following:—Mr. H. DOUGLAS, of Waukegan, Ill., writes to Mr. Meehan (who has published the letter in the February number of the "Gardener's Monthly"), that during a recent dry season he was enabled to dig to the very bottom of his peat bed, or "muck hole," some six or seven feet below the surface. Under the peat he found "what appeared to be the bottom [shore] of a lake, showing clear sand, gravel, and small shells, exactly like the shores of the lakes so common in this country. Imbedded in this gravel we found a boulder, and around it were charred sticks, looking to all appearances like the remains of a camp fire, and near it we found several poles that had evidently been pointed at the thickest end with an instrument not very sharp, proving, at least to my satisfaction, that Indians had camped there, and that the sharpened saplings were their tent poles cut with a stone hatchet. While digging last summer about three rods from the spot named, we

found the bones of the elk,—the horns, a jaw-bone, a leg, etc., and would have got them all, but the water prevented.”

These bones were sent to Chicago, and were pronounced to be of an extinct species of Elk, and probably identical with the species found fossil in the Irish bogs. We do not know to whom these bones were submitted for examination, but we trust that the Chicago Academy will not let this sub-peat deposit remain long without a thorough investigation, and that both bones and fireplace will receive the careful attention which the subject demands. We should like to have any farther information which may be obtained. Our peat beds have not yet received the attention that they demand, when we remember how rich those of some parts of Europe have proved to be in relics of great archaeological importance. No opportunity of investigating our peat deposits should be allowed to pass unheeded.

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## NOTES.

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Some fifteen scientific gentlemen connected with the old American Ethnological Society gathered last evening at the residence of the Honorable E. G. Squier, No. 135 East Thirty-ninth street, to consider the propriety of changing the title of the Association to that of the Anthropological Institute, and the adoption of more serviceable by-laws. Mr. Squier, in introducing the subject of the meeting, said that in the similar organizations of London and Paris the functions of Ethnology had been long since exchanged for the broader ground of Anthropology, so as to embrace under that general title the coöperative labors of the anatomist, the philologist, and archæologist, and combine in one scheme of study whatever relates to historic man. The latest records of the old society having been read by the secretary, Dr. H. A. Stiles, reciting, among other things, the transfer of the effects to the Historical Society of this city, the proposal of change of name was then made by the Chairman, Mr. Alexander J. Cotheal, and adopted unanimously. The “Anthropological Institute of New York” went into session under the same temporary officers. Honorable E. G. Squier was then elected President of the Institute, and

Messrs. J. G. Knox and George Goden, Vice-Presidents. Mr. Squier generously offered to undertake the printing of the records for one year.

Mr. G. R. Crotch, whose annual synopsis of European Coleoptera we have noticed elsewhere, writes that he is hoping to bring out a *Nomenclator Zoologicus*, which shall be, not a continuation merely, but a revision of Agassiz's "*Nomenclator*," and completed to the present day. He promises to bring out the Coleoptera soon. Such a work, if any one can be found to do it, is invaluable to the student, and we hope the proposal will meet with every possible encouragement in this country.

Mr. Crotch's leisure is now devoted to a study of the Coccinellidae of the world. He wants American species, especially some of the common variable species. He would be glad to exchange or purchase. He has large numbers of English and European duplicates, especially in the difficult groups of Staphylinidae and Necrophaga generally, which he would exchange for any American Coleoptera.

Professor A. Rohde gave a very interesting and instructive entertainment in Salem, recently, under the auspices of the Essex Institute. His Geological Pictures give correct and lasting impressions, and should be exhibited before every college and school in the country.

The *College Courant*, copying from the *New York Times*, has given circulation to the story of a "great discovery" near Dubuque, Iowa, consisting of a chamber cut out of stone and containing important relics of a past race, etc. We are sorry that our friend, the "*Courant*," has got so decidedly "sold" in this story of the "ark and the dove" in America, but it turns out that the chamber exists only in the cavernous head of a local editor.

A Zoological Record Association has been established for the purpose of continuing the "*Record of Zoological Literature*" (an annual volume containing an abstract of, and an index to, all that has been done in zoology during the previous year), which has been held in such high esteem by working zoologists that for some time past the British Association has been induced to vote an annual grant of 100*l.* in its support. Owing, no doubt, to the fact of its utility not being sufficiently known to the public, the under-

taking has not proved a financial success. The new association, which includes, we understand, all the leading zoologists of England, hopes to have better luck, and in a few days it is expected that its programme will be before the world. Mr. Stainton, F.R.S., is the Secretary.

### ANSWERS TO CORRESPONDENTS.

C. E. B., Iowa State Agricultural College, Ames. — The worms you found on the apple tree are probably those of the codling moth, and the best thing to do is to pick them all off the tree and look under the bark for others. The moth flies in May. These cocoons are easily found after a little experience, and the winter, autumn or early spring is the best time to look over the trees for the cocoons of these and other moths; also to remove the bunches of eggs of the American Tent Caterpillar, and the Canker worm, if you have the latter caterpillar in Iowa.

The larvæ which you say — "were exceedingly abundant on cabbages last season during the hotter portions, and which feed on the leaves, eating them into holes, effectually spoiling their growth, and ruining the crop; and transform on the under side of the leaves, or on shaded portions of the upper surface, forming little cocoons" — are the caterpillars of the Cabbage Tinea (*P. spidolletta*). It also infests the turnip, and is common all over the world. In Europe there are two broods, one in June, the other at the end of summer. The larva is spindle-shaped, and of a delicate green color, with a gray head. We have found the larva on cabbage leaves late in September. We shall give a farther account of this caterpillar on another occasion.

S. A. N., Mt. Washington. — The mouse you say is common at the house on the mountain is, perhaps, *Arvicola Gapperi*, but your description is not full enough to make sure. Specimens would be very acceptable. — E. C.

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